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No. 69

WATER POWERS OF THE STATE OF MAINE.—PRESSEY

WASHINGTON
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1902

UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

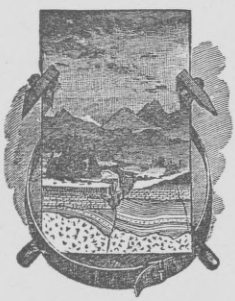
WATER POWERS

OF THE

STATE OF MAINE

BY

HENRY ALBERT PRESSEY



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DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
DIVISION OF HYDROGRAPHY,
Washington, D. C., April 11, 1902.

SIR: I have the honor to transmit herewith a manuscript prepared by Mr. H. A. Pressey, on the water powers of the State of Maine, and to request that it be published in the series of Water-Supply and Irrigation Papers. For a number of years data concerning the streams of this State have been collecting in this division, largely through the courtesy of engineers in charge of water-power-development projects, and there has been a steadily increasing demand for a more complete study of the conditions. This culminated in an offer of cooperation in field work, made semiofficially through Mr. W. T. Haines (of the governor's council), of Waterville, Me., and as a consequence active field work was begun in the year 1901. In order to obtain a full grasp of the problem, and to provide a guide for future operations, as well as to give immediate information of what is already known, Mr. Pressey has brought together in compact form the data obtained from various sources, and presents them herewith. It is planned to supplement this report by annual or periodical statements of the flow of the streams and the developments which have taken place, pointing out at the same time the opportunities for an increased employment of water in various industries.

Very respectfully,

F. H. NEWELL,
Hydrographer in Charge.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

WATER POWERS OF THE STATE OF MAINE.

By HENRY A. PRESSEY.

INTRODUCTION.

Two great resources of the State of Maine stand preeminent: (1) Its water powers, which are unrivaled in the United States, and (2) its forests, which still cover vast areas. It seems remarkable that so little has been done to study or protect either of these. The value of hydrographic investigations for ascertaining knowledge of the fall and flow of streams and of the possibilities of increased storage of water has been recognized by many States of the Union as well as by the National Government. Many of the States are now cooperating with the Government, through the United States Geological Survey, in the study of their water resources, and within the last few years investigation of forest conditions has been placed upon a scientific basis, and great strides have been made toward a betterment of conditions in and the preservation of the forest lands throughout the country.

Many years ago it was prophesied of Maine that "as its industries develop its water power must receive increased attention." Up to this time, however, the studies of its water-power resources have been meager and incomplete.

The report by Walter Wells on the water power of the State, made in accordance with an act of the State legislature, and published in 1869, was an excellent contribution to the available knowledge on the subject. In Volume XVI of the Tenth United States Census (1880) Prof. George F. Swain described with much detail the water powers of the State, and in the Nineteenth Annual Report of the United States Geological Survey, Part IV, published in 1899, Prof. Dwight Porter brought the data down to that year, adding much that was new. No actual measurements, however, of either the fall or the flow of the streams were made for these reports, which were compilations of data gathered from widely scattered sources, supplemented by estimates based thereon. Although these reports were of great value, they should be extended and supplemented by investigations in the field; by measurements of flow, fall, and precipitation, and by studies of the possibilities of increasing the lake storage. Information in regard to the flow of the streams is available in only a few

cases, and in those cases only because of the individual efforts of water-power owners.

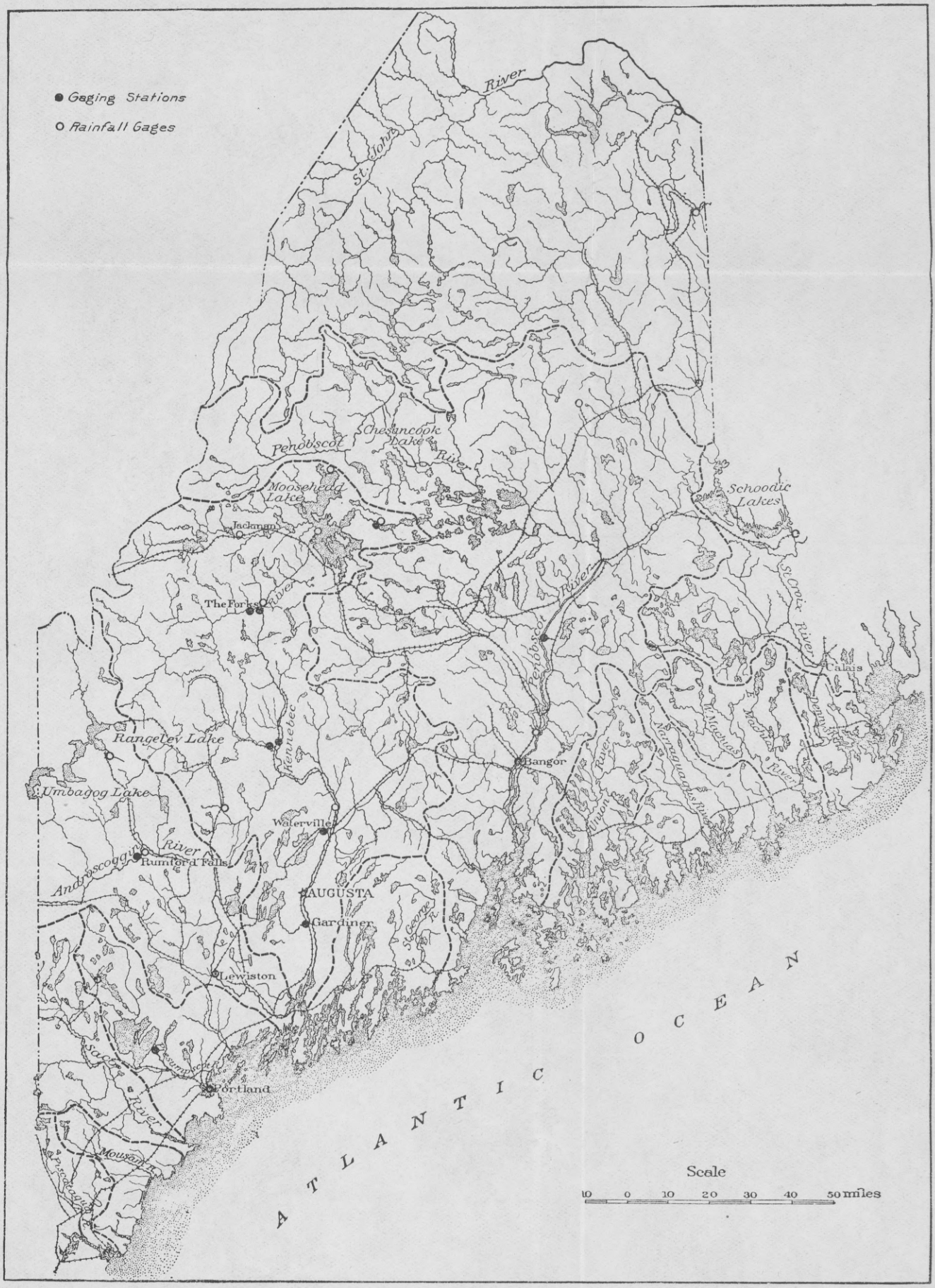
With the object, therefore, of acquiring more definite information regarding the water resources of the State, and at the solicitation and with the cooperation of a number of the mill owners, in the summer of 1901 the United States Geological Survey commenced a hydrographic investigation of Maine. Stations were established on several of the large rivers and their tributaries—at The Forks and at North Anson on the Kennebec, at The Forks on Dead River, at North Anson on Carrabassett River, at Roach River on Roach River, and at Montague on Penobscot River—and additional rain gages were placed in the upper parts of the drainage basins—at The Forks, at Roach River, at Northeast Carry, at Jackman, and at Wytopitlock. This work is preliminary to more complete studies in the near future, and the following paper has been written with the idea of assembling such facts as are known in regard to the rivers. Much of the material has been taken largely from the publications mentioned, and quotations of whole paragraphs have been made whenever thought desirable. An attempt has been made to bring the data down to date, and the latest obtainable information as to power developed, fall, etc., has been inserted in the descriptions of the various streams. It is expected that during the summer of 1902 the investigations will be greatly extended. Descriptions of the stations recently established by the Survey will be found in Water-Supply Paper No. 75.

The writer is indebted to Mr. George Otis Smith, a geologist of the United States Geological Survey, for the sketch of the geology of the State.

GEOLOGY.

Introductory.—Geologic conditions greatly influence the water resources of such a region as the State of Maine. The present configuration of the surface and the rock and soil composing and underlying that surface are the product of past processes, the record of which constitutes the geologic history of the area.

For the purposes of a brief discussion of these conditions, which directly affect the water powers of the State and their availability and permanence as a factor in industrial activity, the geologic history of the State may be divided into two parts, the first covering pre-Pleistocene time and the second the Pleistocene period. These two time divisions differ greatly in length, but not greatly in their bearing upon the water powers. The pre-Pleistocene comprises all time down to the early Glacial epoch, while the Pleistocene includes the time when a glacial ice cap covered the whole area of the State, as well as the following final retreat of the ice and general subsidence of the land. To the pre-Pleistocene belong the geologic processes which produced the rocks from which the present surface has been



MAP OF MAINE, SHOWING DRAINAGE BASINS.

carved; to the Pleistocene belong the activities by which this surface has been in large part modeled.

Pre-Pleistocene history.—Exact knowledge of the geology of the State is confined to a few localities, where the rock formations have been studied in detail and their relations and age have been determined. A considerable area of fossiliferous sandstones, shales, and limestones in the northern part of Somerset and Aroostook counties has been shown to be of Silurian and Devonian age, and with these Paleozoic sedimentary rocks in Aroostook County are associated volcanic rocks.[a] In the central portion of the State the roofing slates of Monson, Brownville, and other localities cover large areas. Other argillaceous rocks, such as shales and schists, occur extensively, and impure limestones and calcareous sandstones are common. The abundance of granite and allied igneous rocks in the central and southern portions of the State is evidenced by the many localities where these rocks are quarried for local use and for shipment to other States. On the coast granite, gneiss, and schists of various kinds occur, associated with limestone and other sedimentary rocks at several places.

A noticeable characteristic of the rocks mentioned as exposed in this area is their compactness and hardness. In general, this may be attributed to their age, most of them dating back probably to the Paleozoic, and some perhaps to earlier periods. A more important factor than mere age, however, is the alteration that the rocks have undergone. In the ages which have elapsed since their deposition they have experienced many changes, by which soft shales have been metamorphosed into crumpled schists, and friable sandstones into flint-like quartzites. The intrusion of large masses of molten granite has doubtless effected some of these changes in the surrounding rocks, and the folding and elevating of the horizontal beds into mountain ranges has been no less effective in the work of induration. The processes of erosion have laid bare the bases of these mountains, which can be seen along almost every river bank, in the closely folded strata that so effectually withstand the attacks of the rushing water.

In a word, then, the State is favored with rocks of a hardness sufficient to make the present channels of the streams permanent, while the complicated structure of the rocks and the consequent alternations of beds relatively hard and soft are the cause of some of the abrupt changes in the grade of the rivers whereby falls and rips succeed quiet reaches.

Pleistocene history.—As in the preceding section, the results of the geologic processes rather than the processes themselves will be considered here. The history of the advance of the ice cap southward over the State and the climatic conditions favoring this glacial occu-

[a] Contributions to the geology of Maine, by H. S. Williams and H. E. Gregory: Bull. U. S. Geol. Survey No. 165, 1900.

pation, and then of the retreat of the ice and the changes in elevation of the land surface, are topics of interesting research, but here it will be sufficient to note the differences between the region at the beginning of this period and at its close.

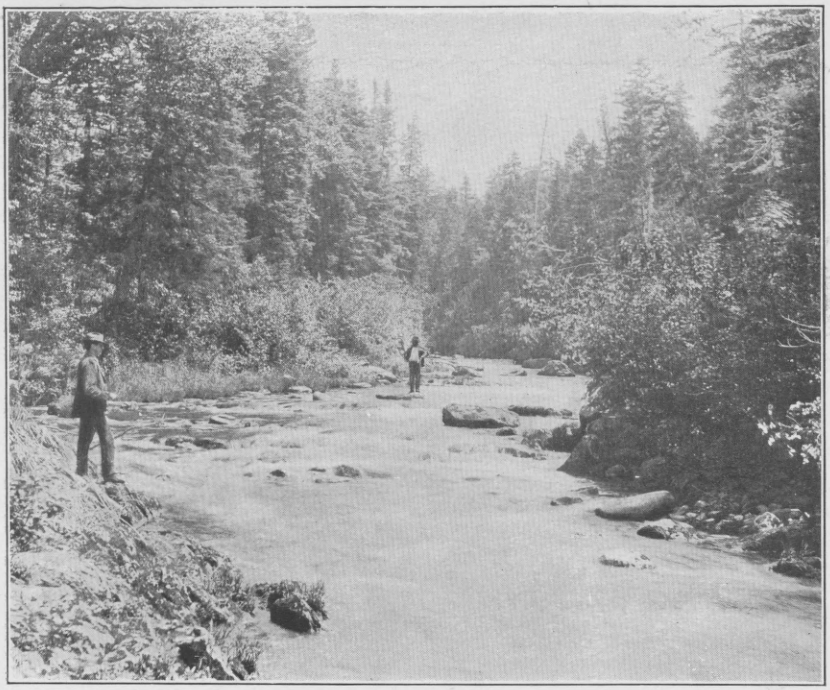
At the time of the first invasion of the ice the topography of the State was probably not widely different from that of to-day. Perhaps the hills rose more abruptly above the valleys, and the larger rivers may have meandered over wide valley floors instead of being confined between terraces. In such valleys bare rock was doubtless of rare occurrence, and everywhere the soil resembled more that found to-day in the Southern States than the gravels, sands, and clays of Maine.

The first result of the occupation of this area by an ice sheet was the cutting away of the decomposed rock and the smoothing down of the outlines of the hills and mountains. So it is that to-day expensive structures can safely be erected along the banks of the rivers close to the water powers, the firm rock foundation affording security against damage by freshet.

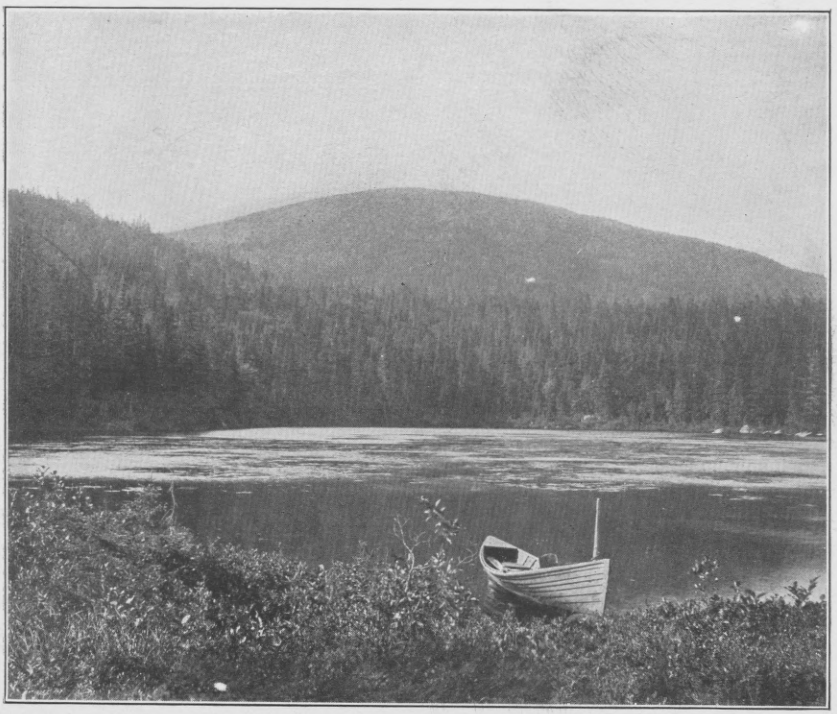
The rock and soil detritus produced by glacial erosion furnished in turn the material for glacial deposits. Streams flowing over the ice, under the ice, and later away from the melting ice front, transported great masses of sand and gravel, as well as fine silt, and deposited them along their courses. During the later stages of the Glacial epoch subsidence of the land caused the sea to advance inland along the principal valleys. The glacial streams thus entered quiet water and deposited their loads in what are now the upper valleys, a hundred miles or more from the sea.[a] These deposits assumed various forms, and thus originated much of the topography familiar to the residents of the State. But such extensive deposits affect more than the scenery of a region. The drainage system of Maine was greatly altered. Old channels were filled with glacial gravels, and the streams, their volume and energy greatly increased by the melting of the glacier, cut new channels. In such a case a river might abandon an old wide valley, possessing a moderate grade well established, and cut across a rock ridge, developing a waterfall. When the history of the rivers of this region is worked out, there will be found many illustrations of diversions which resulted in the development of valuable water powers.

A hardly less important result of the glaciation of Maine are the numerous lakes and ponds so characteristic of almost every portion of the State. The pond region between Sandy River and the Kennebec in Somerset and Kennebec counties is typical. The total area of water surface is great, and the connecting and tributary streams are so erratic in their courses as at once to suggest that the original sys-

[a] The glacial deposits of the State are elaborately described by Prof. George H. Stone in Monograph XXXIV of the United States Geological Survey, 1899.



A. TYPICAL FOREST STREAM OF MAINE.



B. VIEW IN LAKE AND FOREST REGION.

tem of drainage has been so modified as hardly to be recognizable. These conditions are extremely important in their economic bearing, for the ponds and lakes, together with the swamps, constitute a vast storage system which holds the water supply in reserve, and the very indirect communication which many of these natural storage reservoirs have with the rivers serves to hold back somewhat the water in times of freshet. As is well known, it is these drainage modifications, which are directly referable to the glacial occupation, that make the water powers of New England so vastly superior to those of the South Atlantic States.

The present is a period of apparent equilibrium and quiet so far as geologic processes are concerned, yet in reality this may not be the case, so silent and slow moving are these natural forces.

FORESTS.

Nearly the whole of Maine was originally covered with forests. The area of the State is 33,040 square miles, of which 3,145 square miles are water surface, leaving a land surface of 29,895 square miles. Of the latter 9,000 square miles are in farms, leaving about 20,000 square miles in an uncultivated state, largely a wilderness. It has been stated that 2,400 square miles included as farm lands consist of woods. Adding this to the area in wilderness, we have 21,200 square miles of woodland in the State, a territory equal to the combined areas of Massachusetts, New Hampshire, and Connecticut. It will be seen that, despite the extensive cutting that has been done in Maine during the last fifty years, there yet remain vast areas of timber land. A large part, perhaps half, of the area in woods is not available for lumbering, owing to the poor condition of the timber. Pine was formerly the chief tree of the State, but by continued cutting the supply of that timber has been greatly reduced. Spruce, hemlock, fir, maple, beech, oak, birch, basswood, cedar, and poplar, however, grow abundantly and furnish excellent material for the lumberman and the manufacturer. A view of a typical forest of the State is shown in Pl. II.

The lumber industry has been for many years one of the most important in the State, and recently the manufacture of pulp and paper has assumed a position in the front rank. It is said that the entire cut of lumber in the State for the last fifty years has been not less than 25,000,000,000 feet. During 1900 the cut was 784,647,000 feet B. M.,[a] and this is likely to increase. Of this amount 350,000,000 feet of spruce is used yearly by the pulp and paper mills, while most of the remainder is sold as lumber. At the present time there are in the State 30 pulp mills and 29 paper mills. The total amount of capital invested in them exceeds $30,000,000,

[a] United States Census report.

and the total value of the annual product is about $18,000,000. The amount paid in wages is more than $5,000,000 annually, and the amount paid for wood more than $2,500,000 annually.

Most of the valuable timber trees are of slow growth. It is likely that the growth of timber in the State aggregates between 600,000,000 and 700,000,000 feet each year, so that at the present rate of cutting the forests are nearly holding their own. By systematic cutting under forestry regulations, however, the yield of the timber lands could be greatly increased and the young growth be so preserved and fostered that the yearly output would be materially augmented. It is hoped that in the near future those interested in the forests of the State—the lumbermen, the manufacturers, and the State officials—will see the wisdom of employing trained foresters to superintend the lumbering operations, for the figures given show, without further comment, the importance of both water power and forests to the two chief industries of the State, and the development of the water powers and the preservation of the forests are so closely associated that they can not well be separated.

HYDROGRAPHY.

GENERAL FEATURES.

No other tract of country of the same extent on the continent is so well watered—supplied with lakes and streams well distributed—as is Maine. There are five principal lake chains or systems—i. e., large lakes connected by rivers and discharging into main channels which convey their accumulated waters to the ocean. These are, beginning on the western boundary, (1) the Umbagog-Rangeley series, with an area of 90 or more square miles, drained by Androscoggin River; (2) the Moosehead series, forming the headwaters of Kennebec River, the main lake of which is 120 square miles in area, and is the largest inland body of water in New England; (3) the Penobscot series, consisting of Chesuncook and its surrounding lakes on the West Branch of the Penobscot, Alleguash, Chamberlain, and others on the East Branch, and the Seboeis and others connected with it still farther east but flowing into the East Branch of the Penobscot; (4) the Schoodic Lakes, in the southeastern part of the State, drained by St. Croix River; and (5) the many lakes forming the headwaters of St. John River and its tributaries. There are many other lakes in every county, which, though of small area, in the aggregate hold an immense amount of storage water and add much to the importance of the lake systems of the State.

The total number of lakes, not including small ponds tributary to the rivers, is 1,620, and their aggregate area 2,300 square miles, making one lake to each 20 square miles of territory and one square mile of lake surface to each 14.3 square miles of land surface. The following

table gives the names of the lake systems and interesting facts regarding them:

Lake systems of Maine.

Name of system.	Number of lakes.	Aggregate area.	Ratio of lake surface to basin surface.	Average area of lakes.
		Sq. miles.		*Sq. miles.*
Saco	109	84	1:16.6	0.75
Androscoggin	148	313	1:17	1.43
Kennebec	311	450	1:12.9	1.44
Penobscot	467	585	1:14	1.25
St. Croix	61	150	1: 6.5	2.95
St. John	206	350	1:21.1	1.75
Dennys, etc	22	38	1: 9.8	1.72
Machias, East and West	56	68	1:11.7	1.20
Narraguagus	38	25	1:22	0.65
Union (not including islands)	43	60	1: 8	1.39
St. George, Sheepscot, etc	72	50	1:16	0.70
Presumpscot	45	97	1: 5.3	2.10
Royal, etc	6	4	1:42	0.66
Mousam	14	10	1:26	0.71
Piscataqua	22	16	1:34	0.72
Total	1,620	2,300		

The lakes of the larger systems are in the mountain region, more of them on the northern than on the southern side. The outflowing rivers in general work their way through the breaks between the mountains and flow southerly down the slopes to the Atlantic coast. The lake systems are at high elevations for lakes so near tide water, so that the outflowing rivers have large falls in their courses to the ocean. The following table gives the elevations of some of the larger lakes:

Elevations of the larger lakes and ponds of Maine.

Name.	Elevation above sea level.	Name.	Elevation above sea level.
	Feet.		*Feet.*
Moosehead Lake	1,023	Richardson Lake	1,456
Wood Lake	1,094	Mooselookmeguntic Lake	1,486
Attean Pond	1,094	Rangeley Lakes	1,511
Long Pond	1,094	Mattagamon Lake	850
Schoodic Lakes	300	Chamberlain Lake	926
Sebec Lake	375	Pomgocwahem and Churchill lakes	914
Baskahegan Lake	400	Alleguash Lake	950
Pamalumcook, The Twins, and Milinoket lakes	500	Eagle Lake	579
Ripogenus Lake	878	Square and Cross lakes	587
Chesuncook Lake	900	Long Lake	603
Cauquomogomoc Lake	930	Portage Lake	625
Squawpan Lake	580	Fish River Lake	660
Sebago Lake	247	Chiputneticook Lake	382
Umbagog Lake	1,256	Chiputneticook (Grand) Lake	449

Lake Itasca, at the extreme headwaters of Mississippi River, is at an altitude but little greater than that of the Rangeley Lakes. Lake Superior, at the source of the St. Lawrence, 1,800 miles by river from the ocean, is at an elevation about two-thirds that of Moosehead Lake.

Lake Winnepesaukee, in New Hampshire, is at an elevation hardly more than half that of the large lakes at the head of the Penobscot—Chesuncook, Chamberlain, etc. The great elevation of these lakes, the short courses of the rivers outflowing to the sea, and the fact that the lakes are largely located near the headwaters of the streams, make the rivers of the State far better for the development of water powers than the streams in almost any other part of the United States.

The climate of the State is highly favorable for a large and uniform run-off. The average temperature for the year is about 41° F., the average in summer being from 59° to 66°. The evaporation is comparatively small, owing to the low temperatures, the porous soil, the extensive forests, and the prevailing fogs. The rainfall is large and well distributed. Sudden heavy storms are rare, most of the water falling in comparatively gentle rains extending over considerable time. In winter nearly all of the precipitation is in the form of snow, which lies on the ground until late in the spring, gradually melting and adding to the volume of the rivers. The effect of the large rainfall and run-off and the small evaporation, of the topography, of the forest-covered areas, and, above all, of the large storage reservoirs in the form of natural lakes, is very apparent in the discharge of the streams.

A comparison of the records of flow of the rivers of Maine with those of other portions of the United States is most instructive. Many of the largest rivers of the Atlantic coast rise in the Blue Ridge and flow at nearly right angles to the ranges of the Appalachian mountain system. The tributaries drain valleys between these steep ranges, the valleys being narrow and the side slopes steep, so that rain falling upon the mountain sides soon reaches the river channels. In Maine, however, the mountain chains have lost their continuity and appear as groups or masses of low mountains or hills, with comparatively flat slopes and with broad, open river valleys. This topography tends to equalize the rainfall over the watersheds and to prevent the heavy rains from reaching the rivers immediately and causing high waters and disastrous floods. The effect of the heavy forest covering in the upper part of the drainage basins is also very beneficial, tending to equalize the yearly flow of the streams. The lakes, however, have a paramount effect upon the flow of the streams, acting as regulators, which make the rivers of Maine the finest in the United States for water-power developments. In the utilization of flowing water for power it is of the greatest importance that the flow be uniform throughout the year, and so equable is the flow of the streams of Maine that the users of water power in that State seldom realize the difficulties under which developments are made in other parts of the country where there are no lakes, ponds, or marshes upon which to draw during the period of low flow, necessitating the shutting down of the works during that season, or the construction of

auxiliary steam plants, which require fuel and for which interest and repairs must be provided throughout the year.

In those sections the dry season is followed by heavy rains, and, as has been explained, the rain water flows rapidly to the rivers, swelling them to flood heights and requiring strong and expensive constructions to resist its fury. The variation in the flow of the Maine streams, on the contrary, is naturally comparatively small, and when controlled by dams at the outlets of the lakes the uniformity of the discharge is almost unparalleled. An example of what is possible of attainment, under exceptionally favorable conditions, by artificial control in natural reservoirs for even a very considerable drainage area is well illustrated in the case of Sebago Lake, which covers nominally 50 square miles and drains 470 square miles. The average flow of this lake during the working days has in no month in ten years fallen below seven-eighths of a cubic foot per second per square mile; for three-fourths of the entire period it has not varied more than 20 per cent either way from an average of 1.75 cubic feet per second per square mile; and in an especially favorable year the entire range of flow has been not more than 5 per cent either way from the mean for the year. It will be seen that this regularity is most remarkable when compared with the Potomac, a river with a drainage area of 9,654 square miles at Point of Rocks, Md. (where is located a gaging station of the United States Geological Survey), and with a minimum flow of about 1,000 cubic feet per second, or 0.1 cubic foot per second per square mile. This contrast is the more striking when we consider the difference in size of the drainage areas, for the run-off from a large drainage basin is, other things being equal, greater per square mile than from a small one.

Though much has been done to control the storage water in the lakes in Maine, and thereby increase the dry-weather flow of the streams, more effective results could be obtained by systematic and cooperative control. Take, for example, the Penobscot, which at its lowest flow carries, at Oldtown, only one-third of a cubic foot per second per square mile of drainage area, owing to lack of proper regulation. The time will probably come when the manufacturers and log drivers will see the advisability of cooperative control, and when regulating works will be built at the headwaters and this river discharge at its minimum flow several times that quantity of water. Presumpscot and Cobbosseecontee rivers are wonderful examples of the benefits derived from the excellent natural facilities for storage which have been artifically improved.

Although uniform in their flow in comparison with rivers in other parts of the country, the large rivers of the State are subject to great variation when compared with the Presumpscot and the Cobbosseecontee, much greater than would be the case were more extensive controlling works built at the outlets of the various lakes and ponds.

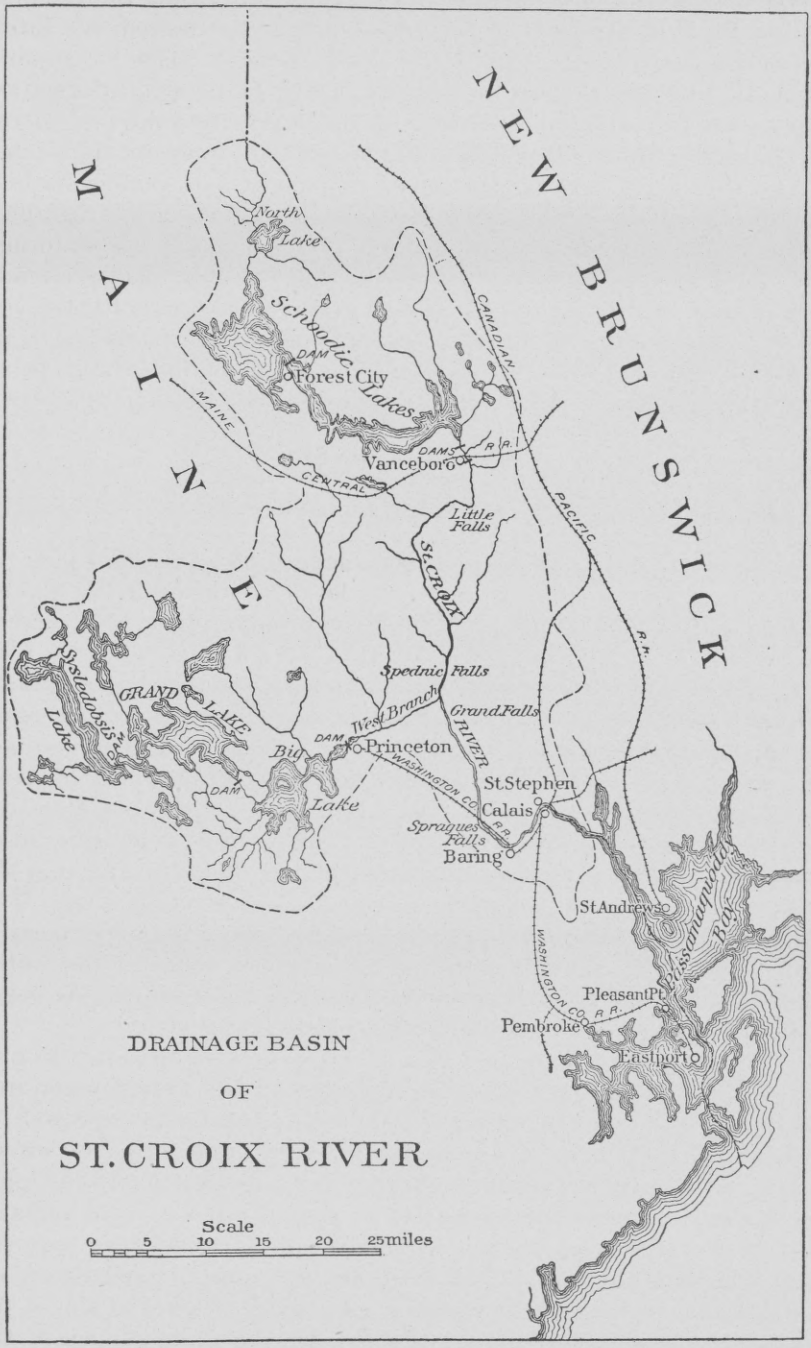
Unfortunately our information in regard to the flow of the rivers of Maine is not as extensive or accurate as might be desired, the information we have being derived from measurements made by corporations and engineers, either for their own use or for general information upon a subject which must always be of the greatest interest to the people of the State. During the summer of 1901, however, the United States Geological Survey established rain gages and gaging stations on several of the rivers, with the idea of extending hydrographic investigations over a series of years, in order to obtain more information as to the possibilities of increasing the power at plants already established, and determine the power available at sites not yet developed. The results of these investigations will be published from time to time, but in order that the data now available may be in form for easy reference, the records of flow are assembled in this paper.

ST. CROIX RIVER.

DRAINAGE BASIN.

St. Croix River is formed by two branches, known as the Upper St. Croix or Chiputneticook River, the outlet of the Schoodic Lakes, and Kennebasis River, the outlet of the western lakes of the area, known as the Kennebasis Lakes. (See Pl. III.) The Upper St. Croix, with its tributary lakes, forms nearly half of the eastern boundary of Maine, separating that State from New Brunswick. The total drainage area of the main stream is about 1,630 square miles, of which 960 square miles are tributary to the great reservoir systems controlled by dams at Vanceboro and Princeton. The length of the stream from the headwaters to the mouth is 100 miles. The basin is, in general, lower than that of any of the larger streams of the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet. The fall from Chiputneticook Lake (the lower of the Schoodic Lakes) to tide water, a distance 54 miles, is, however, 382 feet, or 7 feet to the mile, and there are a number of places where falls and rapids occur at which water power has been or can easily be developed.

The lake system of the St. Croix is the largest in the State in proportion to the drainage basin, except that of the Presumpscot, and as the lakes act as a regulator of flow and can easily be improved for greater duty, St. Croix River may be considered one of the best water-power streams on the Atlantic coast. The lake system of the Upper St. Croix comprises approximately 50 square miles of lake surface, and that of the West Branch 70 square miles, considering only the principal lakes and ponds. Indeed, above Vanceboro and Princeton each branch of the river is simply a succession of lakes to almost the extreme headwaters. Wells estimated the total lake surface of the St. Croix as not less than 150 square miles, or nearly one-tenth of


MAINE
NEW BRUNSWICK
North Lake
Schoodic Lakes
DAM
Forest City
MAINE CENTRAL R.R.
CANADIAN PACIFIC R.R.
DAMS
Vanceboro
Little Falls
St. CROIX
Spednic Falls
GRAND LAKE
Systladobsis Lake
West Branch
Grand Falls
RIVER
DAM
Princeton
Big Lake
WASHINGTON CO. R.R.
St. Stephen
Calais
Sprague's Falls
Baring
St. Andrews
Passamaquoddy B.
Pleasant Pt.
Pembroke
Eastport
DRAINAGE BASIN
OF
ST. CROIX RIVER
Scale
0 5 10 15 20 25 miles

the total drainage area. The drainage area at various points on the river is given in the following table:

Drainage area of St. Croix River.

	Sq. miles.
Main river:	
Vanceboro dam, foot of the Schoodic Lakes	420
Little Falls	500
Immediately above mouth of West Branch	650
Immediately below mouth of West Branch	1,400
Spragues Falls	1,450
Calais, lower dam	1,530
Mouth of river, eastern border of town of Calais	1,630
West Branch:	
Princeton dam	540
Confluence with main river	750

A large proportion of the drainage basin is still covered with timber, and above Vanceboro and Princeton the region is for the most part wild and inaccessible, being visited only by lumbermen and sportsmen. The greater part of the timber in this region is controlled by sawmill owners at Calais and St. Stephen. In 1898 the amount of lumber sawed annually had fallen from about 100,000,000 feet to 25,000,000 feet, and since then the number of sawmills has been greatly reduced. In 1901 the lumber sawed amounted to 28,000,000 feet, showing that the rate of cutting has remained nearly constant during the last few years. There are on this stream favorable locations for paper and pulp mills, but arrangements would have to be made with the sawmill owners in order to obtain a supply of timber.

The river is navigable as far as Calais, except during two months of the year, when it is frozen. Calais has railroad connection with Bangor directly over the Washington County Railroad, and, by way of Vanceboro, over the Canadian Pacific and the Maine Central railroads. There is also a short road connecting Princeton with Calais. Above Princeton the transportation facilities are poor. Calais, Princeton, and Vanceboro, in Maine, and St. Stephen, in New Brunswick, are towns with populations of from 1,000 to 10,000, largely engaged in the manufacture of lumber.

LAKE STORAGE.

The storage in the principal reservoirs of the St. Croix is controlled by the St. Croix Log Driving Company, a chartered association comprising the various mill owners upon the river. This company has a monopoly of log driving on the stream, inasmuch as no one can drive logs unless he comply with its conditions and share its expenses. It maintains dams at certain lakes, in order to drive logs down to Baring, and assesses equitably upon the members the cost thereof. The object of the company is primarily to facilitate

log driving, and for that purpose water is drawn from the lakes in whatever amount needed for a period of perhaps fifty or sixty days, but for the remainder of the season the company seeks to utilize the lake storage as far as possible for the water-power interests of the river.

In the basin of the West Branch the company maintains dams controlling the storage in Big Lake, Grand Lake, and Sysledobsis Lake. The dam at the foot of Big Lake and its prolongation through Long and Leweys lakes is at Princeton, and gives about 5 feet of available storage, the three lakes being credited by Wells with about 16 square miles of surface. At a very small expense this could be largely increased. The tributary drainage area is large, amounting to 540 square miles, and every spring there is wastage at the dam. Grand Lake, the next lake above on this branch, and between 80 and 90 feet higher than Big Lake, is controlled by a dam giving 6 or 7 feet of storage, extending back over Grand, Compass, Junior, and other smaller connecting lakes. The area of water surface commanded can not be given with accuracy, but from Wells's figures it would appear to be more than 25 square miles. Still farther above, at the outlet of Sysledobsis Lake, is a dam giving a storage of approximately 8 feet in that lake, which is stated by Wells to have a surface of 7 square miles.

On the East Branch, or the main St. Croix River, the dam at Vanceboro commands 13½ feet of storage over about 27 square miles in the lower of the Schoodic Lakes (Chiputneticook Lake); while above, at Forest City, another dam gives a few feet of storage over the 25 square miles of the upper of the Schoodic Lakes (North Lake).

There are also private dams on most of the minor streams, but the storage in each case is small in comparison with that obtained at the foregoing lakes. The private dams are not kept in repair, and the reservoirs receive no attention after being drawn down for the season. Much might be accomplished to improve the storage of the river as a whole by bringing these numerous private reservoirs under a general system of control, if that were found practicable. It is doubtless also possible greatly to increase the storage in many existing reservoirs by increasing the heights of the dams. The country surrounding the lakes is flat, and even low dams produce extensive flowage. While improvements of this nature could have easily been made many years ago, when the flowed tracts were woodland, they are not now so feasible in the case of the larger lakes because of the altered uses of the land and the consequent increased damages which would be incurred.

No measurements of the flow of the river have ever been made, so far as can be ascertained, and the experience of the mills now in operation along it throws the only light obtainable on that subject. The level, wooded surface of the basin and the large extent of lake and

swamp area naturally result in a well-sustained low-season flow, despite the subordination of water power to log driving in the management of the storage. On the other hand, the freshet rise is not excessive, the extreme range between high and low water amounting to 6 feet on the Baring dam and probably not exceeding 8 feet anywhere on the river.

WATER POWERS.

A monument marking a point upon the State boundary at the extreme headwaters of the main St. Croix is 538 feet above tide, from which there is a descent of nearly 100 feet to Grand Lake. From Grand Lake to the lower of the Schoodic lakes, or Chiputneticook Lake, as it has also been called, there is a fall of about 60 feet. At the Vanceboro dam, at the foot of Chiputneticook Lake, no power is used, but a half mile or so farther downstream there is a dam at which a fall of about 8 feet was formerly employed for nine turbines operating the machinery of the International Leather Company's tannery. The tannery was burned, and the site is now unutilized. From this point no dam is encountered on the St. Croix before reaching Baring, nearly 50 miles below, excepting an occasional wing dam, built by the log drivers for the purpose of controlling the channel. Despite the relatively low elevation of the St. Croix Basin the river has a good slope, averaging about 7 feet to the mile and amounting to more than 350 feet from below the lower Vanceboro dam to mean tide at Calais. Of this amount approximately two-fifths in the aggregate, or, say, 140 feet, is concentrated at Spednic Falls, Grand Falls, Spragues Falls, and Calais, the remainder being spread over the various rips and the smooth-flowing sections of the stream. At the falls the banks are generally high and rocky, but elsewhere they are commonly low and succeeded by wide, level stretches of wooded land. Here and there, noticeably above the Canoose Rips, the river widens to almost the dimensions of a lake, being for miles a stream 1,000 feet or more in width, with gentle current. The distribution of the entire fall of the river, as determined by Anson's survey, made prior to 1840, and quoted by Wells in The Water Power of Maine, page 115, is set forth in the following table. The figures given, however, are perhaps subject to minor changes for the upper and lower extremities of the stretch considered, due to the construction of dams since the survey was made.

Fall in St. Croix River.

Locality.	Distance from Calais bridge.	Height above approximate low tide.[a]	Fall between points.	Distance between points.	Average fall per mile between points.
	Miles.	*Feet.*	*Feet.*	*Miles.*	*Feet.*
Grand Lake, at foot	54.62	382.6			
			9.7	0.56	
Foot of Kill-me-Quick Rips	54.06	372.9			
			14.6	3.04	
Head of Mile Rips	51.02	358.3			
			22.9	1.00	
Foot of Mile Rips	50.02	335.4			
			83.2	10.07	
Head of Rocky Rips	39.95	252.2			
			24.8	3.38	
Foot of Rocky Rips	36.57	227.4			
			1.0	0.63	
Head of Meetinghouse Rips	35.94	226.4			
			7.7	1.06	
Foot of Meetinghouse Rips	34.88	218.7			
			0.2	1.00	
Head of Haycock Rips	33.88	218.5			
			6.0	0.39	
Foot of Haycock Rips	33.49	212.5			
			0.6	2.88	
Head of Canoose Rips	30.61	211.9			
			11.2	0.56	7.00
Foot of Canoose Rips	30.05	200.7			
			10.7	7.30	
Head of Spednic Falls	22.75	190.0			
			20.1	0.53	
Foot of Spednic Falls	22.22	169.9			
			3.9	2.25	
Grand Falls, head of upper pitch	19.97	166.0			
			20.0	0.56	
Grand Falls, lower pitch	19.41	146.0			
			17.8	7.93	
Head of Enochs Rips	11.48	128.2			
			9.6	0.69	
Head of Sprague Falls	10.79	118.6			
			25.4	0.36	
Foot of Sprague Falls	10.43	93.2			
			6.7	5.05	
Baring bridge	5.38	86.5			
			13.9	3.60	
Milltown, upper bridge	1.78	72.6			
			72.6	1.78	
Calais bridge	0.00				

[a] Mean rise and fall of tide about 20 feet.

After passing the village of Vanceboro the first important pitch encountered is that at Little Falls, about 8 miles downstream, although rapids occur at intervals in the intervening stretch, the most noticeable of them being the Mile Rips. At Little Falls the river descends over ledges perhaps 3 or 4 feet in as many hundred feet. The banks are high and rocky, and the site appears excellent for a dam of moderate height, which probably need not be more than 200 feet long, and which would give a fine pondage over the wide and sluggish stretch of river above. For the first 6 or 8 miles below Little Falls there is a succession of rips of varying degrees of roughness. The river then becomes wide and sluggish, measuring probably 800 or 1,000 feet between banks, and in the 4 miles from Keene Place to Canoose Camp is broken only by the rips near Rideouts. At the Canoose Rips, about 12 miles below Little Falls, the descent is considerable, amounting, according to the table above, to 11 feet in about a half mile. Less than a half mile below the Canoose Rips are the Dog Island

Rips, short but heavy, and for the succeeding 8 miles to the Spednic Falls the river is almost uniformly smooth.

The Spednic Falls are not more than 2 miles above the mouth of the West Branch of the St. Croix, and form an important water privilege. The river here descends in a succession of pitches and rapids, mainly within a distance of 1,000 feet, and with a total fall of about 20 feet in a half mile. At the head of the falls the banks are rocky, though not high, and the main channel is narrow. One or more side channels through which the stream naturally flowed have already been dammed by the lumbermen.

Almost immediately below the mouth of the West Branch are the Grand Falls, comprising what are known as the upper and lower pitches, perhaps a half mile apart, and each covering a fall of 15 or 20 feet. At the upper pitch there is an abrupt fall of about 6 feet, followed by heavy rapids. The river is divided by a rocky island, but by means of a log wing dam its flow has been confined within a single main channel. The lower falls are a close counterpart of the upper falls in all the principal features, and both are regarded as important sites for power.

Below the Grand Falls there are only occasional small rips for 8 miles. Then are encountered the Enochs Rips, closely succeeded by the Spragues Falls, the latter undoubtedly constituting the principal undeveloped water power of the river. A view of the upper pitch of these falls is shown in Pl. IV, *A*. The Washington County Railroad, running from Calais to Princeton, skirts the east bank of the river opposite the falls and crosses a short distance upstream. There is a resemblance to the sites at the Grand and the Spednic falls, in that the river is divided by a rocky island. The channel to the right of this island has been closed, for log-driving purposes, by a long and high wing dam, forcing the river between the island and the left or east bank. This channel is 150 or 200 feet wide, and at the head of the falls the facilities seem excellent for the construction of a dam, which would have for abutments the ledges of the island and the left or main bank, both of which are of sufficient height. Approaching the falls from above, there are heavy rapids for 500 feet, then an abrupt pitch of 6 or 8 feet, followed by rapids and minor pitches for 800 or 1,000 feet farther, the total descent, according to Anson's old survey, amounting to 25 feet in a third of a mile, or if combined with the Enochs Rips to 35 feet in a mile. All things considered, the water power at Spragues Falls is an excellent one. No very close estimate, however, can be made as to the amount of power available. The drainage area is not materially different from that at Calais, and, judging from the experience of the mills in that city, the power probably would not, in an extreme drought like that of 1895, exceed 40 or 50 net horsepower per foot of fall, continuous for the twenty-four hours, or, say, from 1,000 to 1,200 net horsepower for the entire fall

of 25 feet. The shortage of 1895 is attributed in part to unwise management of the lake storage, and it seems certain that throughout ordinary years the power at Spragues Falls is much in excess of the figures given.

In the 5 miles between Spragues Falls and Baring the river has but slight fall, and on that account affords large pondage and valuable storage space for logs. At Baring there is an old, dilapidated, and leaky dam, built from ledge to ledge, affording a head of 8 or 10 feet at the mills, although from the ordinary level of the mill pond to the foot of the rips below the dam the fall is stated to be about 12 feet. Thirty years ago a large amount of lumber was sawed here and 8 or 10 gang saws were in operation; but the old mills have been burned and not rebuilt, and the manufacturing is now confined to two small establishments on the American side of the river making shingles, barrel heads, and box shooks.

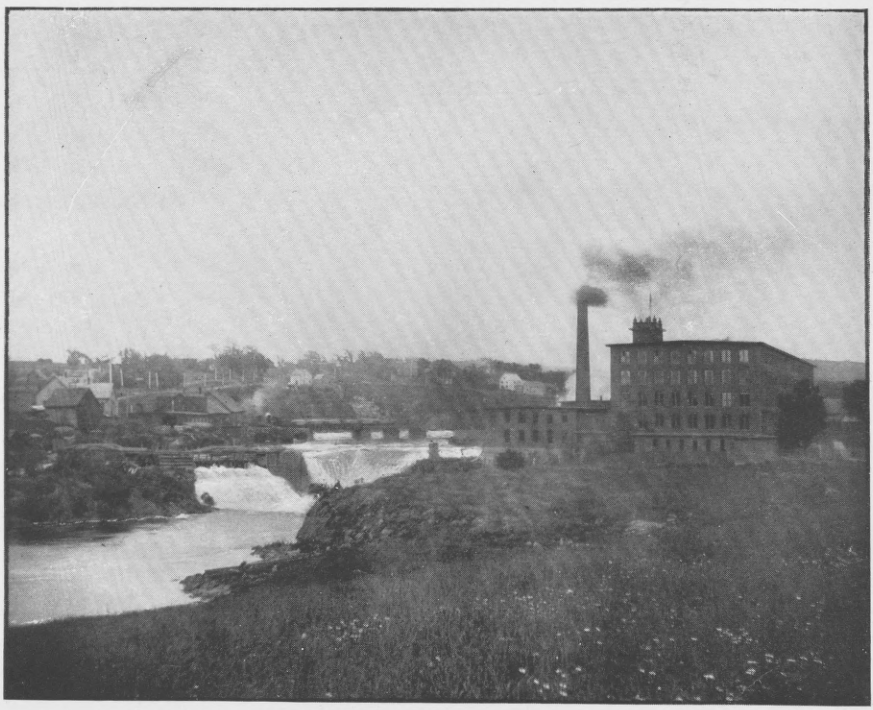
The next and last power is that at Calais and vicinity. The St. Croix, which above this point in general runs between low banks and is depressed but little below the level of the adjacent country, here appears to have worn its channel much below that level, and in less than 2 miles from the surface of the upper pond at Milltown to tide water at the lower Calais bridge descends about 54 feet, measured to ordinary high tide, or about 20 feet more than that if measured to ordinary low tide. Calais and its upper suburb of Milltown lie on the American bank, and St. Stephen and its suburb, also called Milltown, lie across the river. Manufacturing is conducted at four log dams, three of which appear to be old and leaky.

At the upper dam the fall is 12 feet, and the power is owned by H. F. Eaton & Sons, who operate a sawmill on each bank, the one on the Canadian side being equipped with one gang saw and a planing mill, and the one on the American side with two gang saws, a planing mill, and a box machine. These mills have a combined capacity for sawing more than 25,000,000 feet of lumber in a season.

A short distance below the Eaton mills a wing dam on the American side (commanding a part only of the flow of the river) gives a fall of 9 feet, the power being used in James Murchie & Sons' mill, which is equipped with three gang saws, a planing mill, and a shingle mill. On the opposite side of the river is a dam in a dilapidated condition, giving a fall of a few feet, now used only for a gristmill.

The next privilege occurs at what is known as the Salmon Falls, and is the most important and best developed in this locality. It is owned by the Canadian Cotton Mills Company, Limited, which has on the New Brunswick bank a fine mill equipped with 34,000 spindles and 1,100 looms, employing 725 operatives. (See Pl. IV, *B*.) The dam is a tight and costly structure of log cribs packed with stone, the half near the mill being packed with concrete. It develops a normal fall of about 21 feet. Three 54-inch Hercules turbines are installed, but only from 1,000 to 1,100 horsepower is actually employed. For this

A. UPPER PITCH OF THE SPRAGUES FALLS, ST. CROIX RIVER.



B. SALMON FALLS AND MILL OF CANADIAN COTTON MILLS COMPANY, ST. STEPHEN, NEW BRUNSWICK.

there has been no shortage except in the summer or fall of 1895. The mill is dependent upon the continuous flow of the stream, the pond being small and no material aid being received from the storage of night flow either here or at the dams above.

The last dam on the river is near the head of tide water. It gives a fall reckoned at 10 feet normal, but varying with the season from 8 feet at times in dry weather to 12 or 13 feet in freshets. The ordinary tidal rise and fall below the dam is 1 or 2 feet, and that in spring tides 3 or 4 feet. The entire privilege is owned by Mr. Frank Todd, who operates mills on both banks, ordinarily sawing in the aggregate 8,000,000 or 10,000,000 feet of lumber per annum. He also owns the electric-light station, at which 500 horsepower of turbines are installed, about 200 horsepower of which are at present in use. He proposes also to build on the American bank a sulphite pulp mill. Below this dam heavy rapids are exposed at low tide, but, being near the head of tide water, the power is of little consequence.

WEST BRANCH OF ST. CROIX RIVER.

The West Branch has a much larger drainage area than the East Branch, or what has been called the main St. Croix River, comprising 750 square miles at the confluence of the two streams and 540 square miles at Princeton. No power is used, however, except at the Princeton dam, at the foot of Big Lake, or, perhaps more properly, at the foot of the eastern extension known as Leweys Lake. This dam is an old structure, clearly allowing much leakage, and gives a head at the mills, at a favorable stage of the water, of about 9 feet. Power is used for F. Mercer & Sons' gristmill, box mill, and sawmill, the latter manufacturing from 7,000,000 to 8,000,000 feet during the season, and for S. L. Peabody's one-set woolen mill.

From Princeton to the mouth of the West Branch, a distance of about 8½ miles, the fall amounts to between 12 and 13 feet, according to Anson's survey. Much of the way the stream flows between low banks, from 250 to 350 feet wide in the narrower portions of its course, but in places spreading out to a much greater width. The current is gentle and the surface smooth, broken only by the Tomah and the Black Cat rips, both of which can readily be ascended by poling in a canoe. Above Big Lake the outlet stream from Grand Lake has a fall, by Anson's survey, of 82 feet in its length of 2¾ miles, doubtless furnishing good water powers, but at present removed from settlement and from railroad communication.

PENOBSCOT RIVER.

DRAINAGE BASIN.

The Penobscot has the largest drainage basin of all the rivers in Maine, comprising about 8,500 square miles, or more than one-quarter of the entire State. (See Pl. V.) Its greatest length from north to south is 160 miles, its greatest width 115 miles, all within the State.

Eight hundred square miles of the basin discharge their waters into the main river below its lowest water power at Bangor.

The basin is at a lower elevation above the sea than the basins of the Kennebec and the Androscoggin, as would be expected from the general southeasterly slope of the country toward the Atlantic Ocean. The northern portion, however, is rather elevated, having a mean height of about 1,000 feet. The highest portion of the basin is at the headwaters of the main river, where the elevation is from 1,600 to 2,000 feet.

Taken as a whole, the basin is rather uniform in its topographic features. Hills and low mountains stretch from near the sea above Bangor; farther north is an undulating plain, while to the west the surface becomes more broken and greatly diversified by hills, detached peaks, lakes, ponds, and swamps. At the south the basin merges into that of the Kennebec, and at the north into that of the Alleguash, terminating on the northwest, at the boundaries of the State, in a highland region intermingled with swamps and lagoons, the latter furnishing water to the Penobscot and the St. John. A large part of the basin is what is known as "wild land," being heavily timbered and known only to the lumberman and the sportsman. Few regions in the country are more delightful to the lover of nature than the forests, the lakes, and the mountains on the headwaters of the Penobscot. From Mount Katahdin, the highest mountain of the State, a view can be obtained in all directions, overlooking the extensive plain and showing vast stretches of forests dotted here and there with lakes.

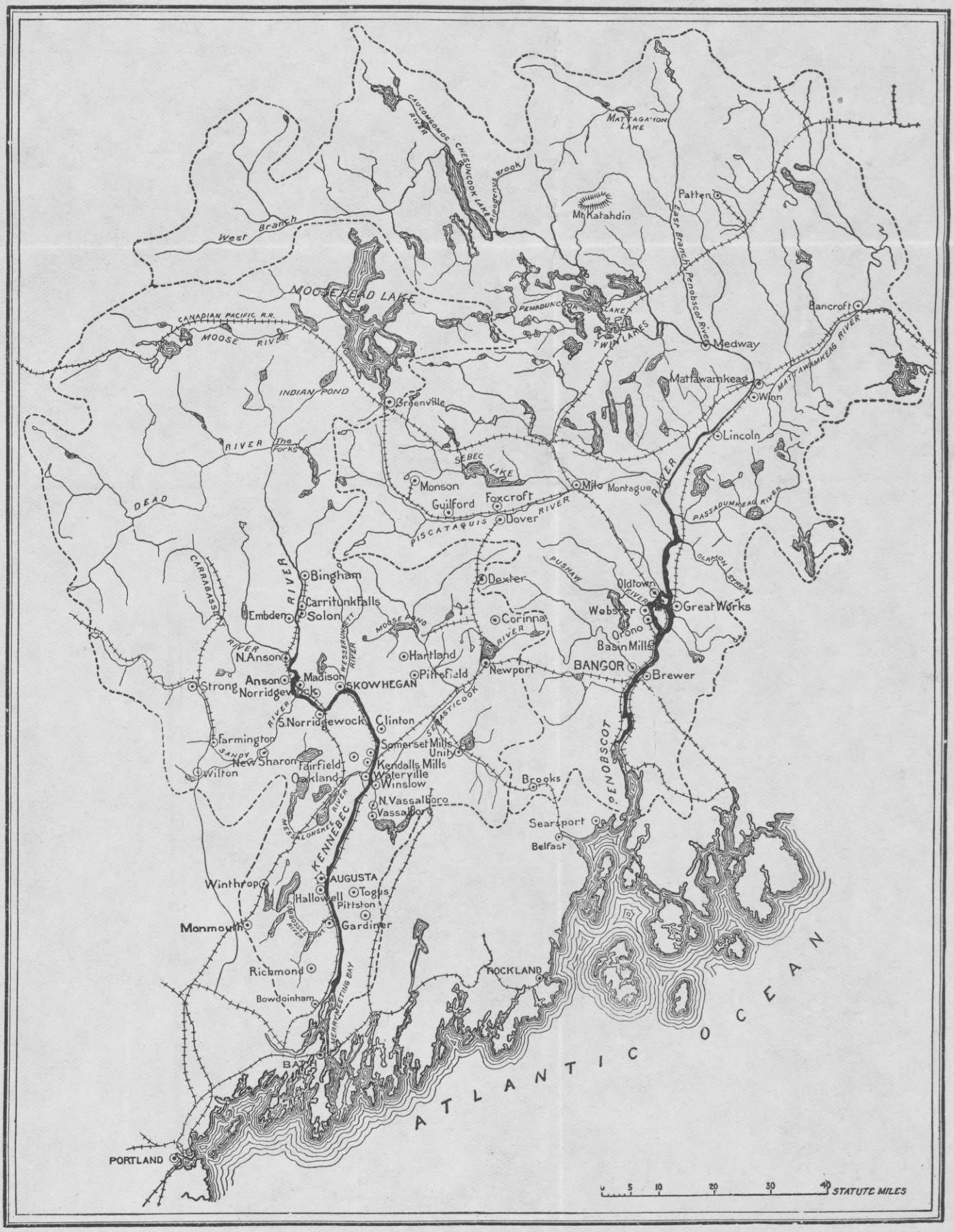
Over the upper portion of the basin slate is the principal surface rock, being succeeded to the east and south by schists, gneiss, and granite; the soil is mainly gravel, clay, and loam.

The drainage areas of the river and its chief tributaries are given in the following table:

Drainage areas of Penobscot River and principal tributaries.[a]

River.	Locality.	Drainage area.
		Sq. miles.
Penobscot	Opposite northwest extremity of Moosehead Lake, township of Seboomook, immediately below mouth of Nulhedus Creek.	600
Do	Entrance into Chesuncook Lake	870
Do	Outlet of Chesuncook Lake	1,440
Do	Outlet of Twin Lakes	1,990
Do	Immediately below mouth of East Branch of Penobscot	3,160
Do	Immediately below mouth of Mattawamkeag River	4,810
Do	Immediately below mouth of Piscataquis River	6,590
Do	Oldtown, above mouth of Pushaw River	7,240
Do	Bangor	7,910
Do	Mouth	8,550
Cauquomogomoc	Entrance into Chesuncook Lake	230
East Branch of Penobscot	Mouth	1,170
Mattawamkeag	Immediately below outlet of Baskahegan Lake	190
Do	Mouth	1,530
Piscataquis	Dover	380
Do	Immediately below outlet of Sebec Lake	750
Do	Mouth	1,500
Passadumkeag	....do	400

[a] Measured on G. W. & C. B. Colton & Company's map of Maine, published in 1883.



DRAINAGE BASINS OF PENOBSCOT AND KENNEBEC RIVERS.

The river naturally has a comparatively uniform flow throughout the year, which is due to the extent of the tributary area, its extensive system of lakes, the vast breadth of forests upon its drainage surfaces, and the more uniform surface of the basin, in which particular it has decided advantage over the Saco, the Androscoggin, and the Kennebec.

The United States Geological Survey now maintains a gaging station on the river at Montague.

LAKE STORAGE.

In common with the other large rivers of the State, the Penobscot has a great many lakes and ponds which serve to regulate naturally the flow of the river, and which could be utilized to far greater extent to increase the low-water flow for manufacturing purposes. There are in all 467 lakes in the Penobscot Basin. The aggregate area of these is estimated to be 585 square miles, or 1 square mile of lake surface to each 14 square miles of land surface. The following table gives the areas of the principal lakes and ponds. The lakes range in size from about 22 square miles (Chesuncook) downward, nine of them covering an area of 10 square miles or more each, and the average of all being about 1.2 square miles.

No single lake or series of lakes of the Penobscot system can compare with the Umbagog series of the Androscoggin, or with the Moosehead of the Kennebec, nor, when drainage basins are compared, with the Schoodic Lakes of the St. Croix, the Eagle Lakes of the Fish, or Sebago Lake of the Presumpscot, as a reservoir to tide over dry-weather flow. Considering size of basin and main drainage stream, the leading lakes are relatively smaller and are scattered, so that they can not be commanded by a few artificial constructions. The river can not be fully developed and the greatest amount of power realized until power plants have been constructed on the main stream and on the many tributaries, so that each small dam will do its part in holding back the flood flows and permitting the water to slowly flow toward the ocean, and thus augment the dry-weather flow. The possibilities of largely increasing the storage in the lakes at the headwaters are particularly favorable, requiring only the construction of low dams. The areas overflowed on the shores of the lakes and in the swamps (of the latter of which there are many) would be of but little value.

Surface areas of principal lakes and ponds in the Penobscot Basin.

Draining to—	Sq. miles.
Piscataquis River	85.90
Passadumkeag River	31.25
Mattawamkeag River	53.35
East Branch of Penobscot	42.30
Penobscot River above outlet of Chesuncook Lake	80.65
Penobscot River between Chesuncook Lake and outlet of Twin Lakes	64.25
Penobscot River between outlet of Twin Lakes and Bangor	54.50
Total	412.20

CONTROL OF STORAGE AT TWIN DAM.

The uppermost point at which the Penobscot is at present directly touched by a railroad is Twin dam, at the outlet of North Twin Lake. Here is controlled, for log-driving purposes, the splendid storage afforded by North Twin, South Twin, Pemadumcook, Ambajejus, and other connecting lakes. The dam by which this is effected is a timber structure about 400 feet long, with perhaps 100 feet of embankment at each end. It consists of a series of log and stone crib-work piers alternating with gates and sluiceways, and is a very old structure, in a somewhat dilapidated but perhaps serviceable condition. The distance from the top of the cross timbers to the bottom of the gates is about 17 feet, which substantially measures the depth of storage afforded by the dam. The lake fills regularly in the spring, and by May or June water is overflowing the dam.

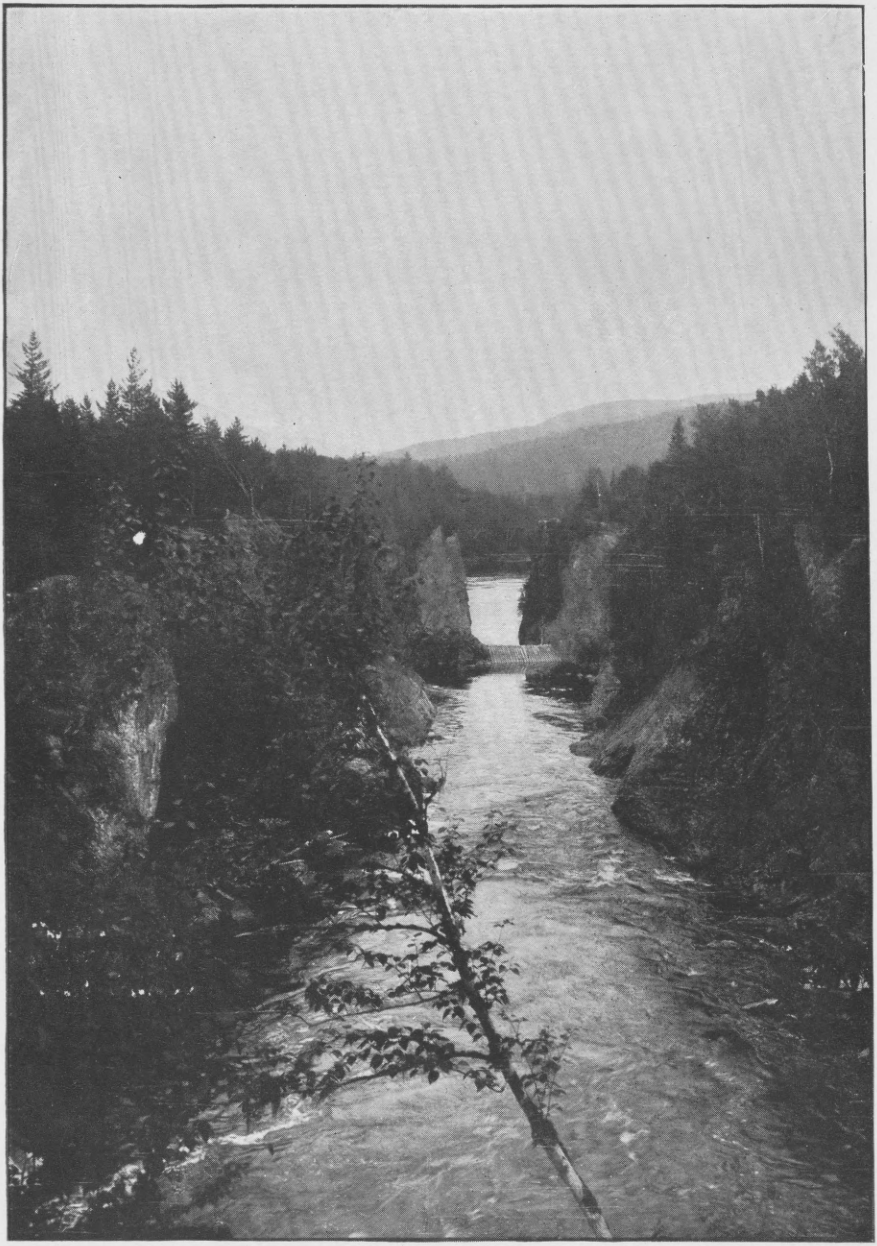
The logs driven down from the Upper Penobscot and other tributary streams are finally collected in the lake and towed in rafts to the vicinity of the North Twin dam, where those destined for the Great Northern Paper Company are separated from the rest of the drive and held for use at Milinoket. This dam was built by the Penobscot Log Driving Company. The water stored in the Twin Lakes is used for log-driving purposes so far as necessary. The same company maintains dams farther up the Penobscot, at the foot of Ripogenus and Chesuncook lakes, as well as at the outlet of Milinoket Lake, which drains into the Penobscot about 6 miles below the North Twin dam.

At the outlets of most of the other and smaller lakes there are also dams maintained for log-driving purposes by individual owners. About 5 miles below the North Twin dam is the concrete dam built by the Great Northern Paper Company in the development of their power at Milinoket. This dam is about 20 feet high and backs the water nearly to the North Twin dam, raising the surface of Quaquish Lake several feet.

WATER POWERS.

As has been stated, the elevation of the basin of the Penobscot is not as high as that of the basins lying farther to the west. At the remote sources of the river, 200 miles by water from the outlet into Penobscot Bay, the divide averages perhaps 1,800 feet above sea level. In the 50 miles from the head of the southwestern branch to Chesuncook Lake there is a descent of about 600 feet, but the stream is small and practically inaccessible.

Below Chesuncook Lake the river falls about 400 feet in less than 20 miles before entering Pemadumcook and Twin lakes, but it is in a wilderness having no direct railroad communication. Part of this distance it flows through a narrow channel with steep and rocky sides,



GREAT ARCHES AT RIPOGENUS, BELOW CHESUNCOOK LAKE, PENOBSCOT RIVER.

the current of the river being swift, with frequent falls over rocky ledges. (See Pl. VI.)

In the 30 miles between the Twin Lakes and the mouth of Mattawamkeag River the Penobscot descends 288 feet. A portion of this fall is utilized at Milinoket, where has been constructed the largest pulp and paper plant in the world. The total flow of the river at that point is diverted through a canal about a mile long, used in one head of 110 feet, and turned into Milinoket River as a tailrace.

In the 60 miles from the mouth of the Mattawamkeag to Bangor there is a fall of 177 feet. About half of this fall occurs in the 14 miles from the head of the Cookis Rips, above Oldtown, to tide water at Bangor, and in this distance several power developments have been made, dams being built across the main channel at five places, utilizing an aggregate fall of between 55 and 60 feet. There are also three dams on what is known as Stillwater Branch, at Stillwater, and at Orono. Farther upstream, at Montague, a 20-foot fall in the main stream is utilized.

The following table gives the elevations at various points on the river:

Fall in Penobscot River.

Locality.	Distance from mouth of river.[a]	Height above mean tide.	Fall between points.	Distance between points.	Average fall per mile between points.	Authority.
	Miles.	*Feet.*	*Feet.*	*Miles.*	*Feet.*	
Penobscot Lake, head of Southwest Branch.	218	1,509				
			475	25	19.0	
Off northwest angle of Moosehead Lake.	193	1,034				
			134	24	5.6	Wells: The Water Power of Maine, p. 101.
Head of Chesuncook Lake.	169	900				
Foot of Chesuncook Lake.	151	900				
			400	18	22.2	
Head of Pemadumcook Lake.	133	500				
Foot of the Twin Lakes.	116	500				
Bangor and Aroostook Railroad crossing, below foot of the Twin Lakes.	116	465				Moses Burpee, chief engineer Bangor and Aroostook Railroad.
			288	29	9.9	

[a] Measured on Colton's map of Maine.

The Milinoket mills utilize a head of 110 feet, and at full gate have a capacity of 20,000 horsepower. Gagings of the canal show that when running at its full capacity the canal carries 19,000 cubic feet per second. There is, however, surplus power at this plant, so that at no time are all the gates open to their full capacity. With the Milinoket Company and the three other large pulp mills operated by water power, the pulp industry may be considered the most important on the river.

Above Oldtown the river contains numerous islands, dividing the stream into channels, which have proved favorable for the handling

of logs to be sawed at the various mills below. There are seven of these mills operated by water power on the Penobscot and the Stillwater Branch, and with their planing, shingle, lath, clapboard machines, etc., they are the second largest users of power on the river. The sawing season, however, lasts only about six months—from May to November—the river being frozen over the remainder of the time, thus precluding the handling of logs in the customary manner.

About 3 miles above Bangor, at Veazie, is the electric power and light station for the city of Bangor, operated by about 1,500 horsepower of turbines. One hundred and twenty horsepower or thereabouts is used by an electric-lighting station at Oldtown, and 250 horsepower for the municipal lighting plant at the Bangor pumping station. Water power is also utilized for pumping public water supplies from the river at Oldtown, Veazie, and Bangor. These works, with those already enumerated, and with a single woolen mill at Oldtown and a cant-dog shop at Orono, comprise all the users of water power from the Penobscot.

The power development at Milinoket utilizes the total fall between the North Twin dam and the outlet of Milinoket River. Between the latter place and Medway there is a large fall that is still undeveloped. At Medway the flow is largely increased by the addition of the waters of the East Branch, and at Mattawamkeag by those of Mattawamkeag River. From Medway to Mattawamkeag the water is relatively smooth, although with a swift current.

A short distance below the mouth of Mattawamkeag River the Penobscot, there about 500 feet wide, is crossed by the Canadian Pacific Railway; but there is neither bridge nor dam elsewhere upon its course below Milinoket until the immediate vicinity of the mouth of the Piscataquis is reached. In the stretch from the Mattawamkeag to the Piscataquis the river has a good current, with rapids at what are known as the Five-Islands Rips, opposite the village of Winn, and at the upper and lower Mohawk Rips, opposite South Lincoln. At Winn the rapids are heavy, the river bed is composed of rock, which here and there rises above the water surface, the banks are high, and the site appears to be an important one for the development of power. At the lower Mohawk Rips the river is probably 800 or 1,000 feet wide, the bed partly of rock and strewn with bowlders, the banks gravelly and of fair height, but the site appears of much less consequence than that at Winn.

Between the towns of Enfield and Howland, and a quarter of a mile or more above the mouth of the Piscataquis, is the power plant of the Piscataquis Falls Pulp and Paper Company, whose mill has a capacity for manufacturing daily 40 tons of mechanical wood pulp. This privilege was developed six or eight years ago, and practically the same men who compose the Piscataquis Falls Pulp and Paper Company have a mill at Great Works, below Oldtown. The dam, like almost

all of the dams on the rivers of Maine, is a log crib-work structure packed with stone. Its length is about 1,000 feet, and, as is necessary upon a river so largely utilized for log driving, a sluiceway for logs is provided in the central part of the structure. The hydraulic canal follows the east bank for about 1,000 feet, or to the mill, taking the course of an old navigation canal by which steamboats formerly passed the falls. At the mill a head of 20 feet is obtained for the turbines, of which 2,500 horsepower are installed. There is no lack of water, except occasionally a slight shortage in the latter part of August or the early part of September.

Below the Piscataquis there are no dams until Oldtown is reached, but there are occasional rapids offering possible sites for the development of power. Where confined within a single channel the river appears generally to be nearly or quite 1,000 feet in width, but islands frequently divide it into several channels, The Passadumkeag Rips are close to the mouth of Passadumkeag River. Here the banks are of good height, and there is considerable exposed rock in the east bank and on the river bed, but it is questionable whether a dam of suitable height could be built without causing backwater upon the privileges on the main river and on the Piscataquis at Howland. A more promising site is that at the Birch Island Rips, perhaps 2 or 3 miles below the mouth of Olamon Stream. These rips are short, but strong, and the river is divided by a rocky island.

Above and in the vicinity of Oldtown, as already mentioned, the Penobscot is divided by many islands, differing greatly in size; the channels between them are variously controlled and utilized in the operations of sorting, storing, and driving logs. Opposite Oldtown the waters become confined to substantially two channels—the main Penobscot River and the Stillwater Branch—between which the flow in low stages appears, from measurements made ten or twelve years ago by Prof. George H. Hamlin, to be divided in the ratio of from five to eight parts in the former to one part in the latter, and on which the water-power improvements at Oldtown and Orono are situated.

On the main river the upper privilege at Oldtown is owned by the Bodwell Water Power Company, which leases power to the present users. The dam is a log crib-work structure from the left bank to an exposed ledge in the center of the stream, and from that point to the right bank it is built of squared timbers, the spaces being filled with stone. The influence of this dam extends a mile or more upstream, and is terminated by short but heavy rips in the channels into which the river is divided. On the left bank the fall available at the mills is stated to be 15 feet, and power is used by the sawmills of B. B. Thatcher & Company and the Jordan Lumber Company, which together manufacture from 20,000,000 to 25,000,000 feet of lumber during the season, and by the Oldtown Electric Light Company,

which uses more than 100 horsepower. On the right bank water is admitted through a substantially constructed bulkhead to a canal 40 or 50 feet wide, inclosed by a heavy wall on the river side and carried downstream as far as required for the present works. The head obtained on the turbines is 11 feet, and the power is utilized by the Oldtown Woolen Company, which has an 8-set mill; by the Public Works Company, of Bangor, for operating pumps for the public water supply, the delivery being about 600,000 gallons per day; and by the Nekonegan Paper Company, for the manufacture of pulp.

The next privilege below on the main river is that at Great Works, owned by the Penobscot Chemical Fiber Company, which manufactures about 25 tons of wood pulp a day. The fall amounts to 14 feet, and the company operates 1,040 horsepower of turbines on the west bank, and occasionally a single wheel of 146 horsepower on the east bank. Power is also leased to Messrs. Mullen & Engel for a sawmill having a capacity for manufacturing 20,000,000 feet of lumber during the season.

On the Stillwater Branch there are three dams. The uppermost dam is at the village of Stillwater (ward 5, Oldtown), where a fall of 18 feet is obtained. The entire privilege is owned by the Orono Pulp and Paper Company, and is not at present used. The second and third dams are close together, and but little above the confluence of the Stillwater Branch with the main river. They are in the town of Orono, between Orono village, on the west bank, and what is locally known as Webster, on the east bank. The principal use of power is by a pulp mill of the International Paper Company, which combines the fall past both dams into a single fall, amounting to 26 or 27 feet, and has 3,000 horsepower of turbines installed. In the low stages of late summer flow not more than half that amount of power is obtained. The pulp is manufactured into paper on the opposite, or Webster, bank by the same company. At the paper mill the lower fall only is used, and 300 horsepower of turbines is installed. Power is also utilized at these dams for the sawmills of William Engel & Company and Adams & Company, which together manufacture from 12,000,000 to 20,000,000 feet of lumber annually, and at Mansfield & Company's shop, for the manufacture of cant dogs.

Passing below the junction of the Stillwater Branch with the Penobscot, the first privilege is that at the point locally known as Basin Mills, in the town of Orono. Here a long log dam across the principal channel diverts water, through a small channel formed by an island, to the sawmills of James Walker & Company, the continuation of the channel serving as a tailrace, and the conditions thus being peculiarly favorable for the safe and convenient utilization of the river. The head obtained is 10 feet, and about 13,000,000 feet of lumber is manufactured each season.

The next dam is 3 or 4 miles farther downstream, at Veazie, about 5 miles above Bangor. Here the power was originally utilized by sawmills, which have now been discontinued and succeeded by the extensive electric plant of the Public Works Company of Bangor. The working head obtained on the turbines ranges from 7 to 11 feet, according to the stage of the river in different seasons. Under the larger head the wheels at present installed furnish an aggregate of 1,650 horsepower, 1,500 horsepower of which is used for generators and 150 horsepower for pumps furnishing the water supply of Veazie and Brewer. There is a steam plant of the same capacity as the turbines, for some steam power is necessary at times in the summer. The electricity developed at this station is utilized for street lighting at Brewer, a town across the Penobscot from Bangor, for private incandescent and arc lighting in Bangor, and for operating the city electric car lines in Bangor as well as the suburban lines running northward to Oldtown and southward to Winterport.

The final water privilege on the Penobscot is about a mile above the business portion of Bangor, and is utilized for the municipal water supply and electric-lighting plant of that city. There is considerable oscillation below the dam, due to the tide, and the head on the turbines ranges from 4 to 8 or 9 feet, according to the stage of the river and the tide. There are at present five turbines in use, rated at 125 horsepower each under an 8-foot head. One of these is used continuously for operating the mechanical filter plant; four are needed during the day for the general demands of pumping, while at night two are devoted to the street lighting of Bangor. Considerable improvements and enlargements of the plant are in progress.

The figures at hand for the volume of the lower river are few, and those for the fall are neither definite nor probably very accurate. The latter, however, seem to give a fall from the head of the Stillwater Branch above Oldtown to mean tide at Bangor of from 80 to 85 feet. Combining with this fall the figures of flow given on pages 37–38, it appears that the power of this portion of the river at practically its lowest stages is equivalent to from 18,000 to 20,000 net horsepower continuous use for the twenty-four hours. Although the actual power now employed can not be stated, it is evident that the full power of the river is far from being utilized. Of the 80 feet or thereabouts of fall mentioned, only about 56 feet is embraced in the falls at the dams on the main river, the remainder being represented chiefly at the scattered rips between the head and the foot of the Stillwater Branch. Whether a portion of the latter power could be utilized to advantage in an independent privilege, or to what extent it could be incorporated in existing privileges, can only be determined after further investigation.

ARTIFICIAL CONNECTION BETWEEN ST. JOHN AND PENOBSCOT RIVERS.

So low are the divides between the Upper Penobscot and the St. John and Kennebec basins that a diversion of water to or from the former river is comparatively easy. More than forty years ago an artificial connection was established between the upper waters of the Alleguash, a tributary of the St. John, and the East Branch of the Penobscot. This was brought about by means of a dam at the northern or outlet end of Chamberlain Lake, a feeder of the Alleguash. The waters of that lake were thus turned back through two connecting lakes, Telosmis and Telos, and from the latter, through an artificial cut, to Webster Lake, in the Penobscot Basin. There was also a dam farther down the Alleguash, at the foot of Churchill Lake, flooding the latter back into Heron Lake, from which locks permitted the floating of logs up into Chamberlain Lake and thence to the Penobscot; but these works have long since gone to decay. The dam at the outlet of Chamberlain Lake and that at Telos Lake, however, are still in use. At the time of the spring drive the waters of Chamberlain Lake are turned through the Telos cut into the East Branch of the Penobscot to facilitate the passage of the drives down that river. At the close of the driving season the gates at the Chamberlain dam are opened, and the water of that lake is permitted to pass both ways. All timber, therefore, which is delivered below Chamberlain Lake on the Alleguash waters must go down the St. John, while that delivered at Chamberlain Lake, although it can go either way, is driven down the Penobscot to market.

The headwaters of the Penobscot and of Moosehead Lake, the largest lake in the Kennebec Basin, are only 2 or 3 miles apart, and it was once planned to build a sluiceway to unite them. This sluiceway was never constructed, however, but a traveling endless chain was installed to haul the logs from Meadow Pond, into which the water was set back by a dam across the Penobscot. From this pond the logs were elevated by an endless chain to the upper end of a V-shaped sluiceway which leads down the southern slope to Moosehead Lake. It is said that when this carrier was in use one-third of a million feet of lumber a day was thus transported.

FLOW.

No extended record of the discharge of Penobscot River has been kept. Few figures of its flow have been published, and these are of little value, being isolated measurements accompanied by few data as to the relation existing between the flow determined and that at high and at low water. In the fall of 1884 Prof. George H. Hamlin, of the University of Maine, made measurements of the main stream at Orono, also of the East and West forks of the Stillwater Branch at the foot of

Orono Island. These measurements were made on September 20, 22, and 23, with subsurface floats, and the discharge was found to be 3,480 cubic feet per second, corresponding to 0.48 cubic foot per second for each of the 7,240 square miles of tributary drainage area. About 85 per cent of the discharge was through the main river. The result thus obtained was considered by Professor Hamlin to represent the average extreme low-water discharge.

On September 7, 1886, the East and West forks of the Stillwater Branch were measured in the same manner, and on October 23, at substantially the same stage of water, the main river was measured about a quarter of a mile below the works of the Penobscot Chemical Fiber Company. The Ellis current meter was used for these measurements, and the total discharge of the river was found to be 2,470 cubic feet per second, equivalent to 0.34 cubic foot per second per square mile. This discharge Professor Hamlin regards as corresponding to extreme low water. He states that the river has at rare intervals been lower than it was at that time, but only slightly lower. In the measurements of both 1884 and 1886 it is believed that the results obtained represented the average flow for twenty-four hours.

A record of the flow of the river at the Sunk Haze Rips, near Costigan, Me., was kept from September 15, 1899, to September 22, 1900. The rating curve was constructed from tube-float measurements made by Mr. George F. Hardy and reported to the supreme court of the State on October 23, 1901. The area of the drainage basin at the Sunk Haze Rips is 7,450 square miles. The results of these measurements are given in the following tables:

Daily discharge, in second-feet, of Penobscot River at the Sunk Haze Rips, near Costigan, Me., for 1899.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		3,450	3,300	4,800	18	2,350	2,330	4,400	10,150
2		4,250	5,600	5,100	19	2,900	2,330	5,100	10,150
3		5,100	10,850	5,950	20	2,380	2,390	5,250	10,500
4		3,900	12,200	8,000	21	2,450	2,430	5,950	11,000
5		3,550	11,000	8,750	22	2,750	2,350	6,240	11,250
6		3,360	10,850	8,650	23	2,670	2,100	6,700	11,200
7		3,190	10,500	8,650	24	2,850	2,670	6,800	10,300
8		3,300	14,000	7,700	25	2,450	2,420	6,450	9,850
9		3,200	9,090	8,500	26	3,410[a]	2,320	5,600	9,750
10		3,100	8,300	7,900	27	3,300[a]	2,100	5,100	9,200
11		3,100	7,620	7,440	28	3,140	2,330	5,250	8,850
12		2,950	7,300	7,230	29	3,020	2,160	5,600	8,570
13		2,750	6,020	9,400	30	3,190	2,000[a]	5,800	8,400
14		2,630	6,240	11,500	31		2,550		9,430
15	2,830	2,630	6,100	11,500					
16	2,640	2,330	6,100	10,000	Mean	2,808	2,764	7,170	9,014
17	2,600	2,410	5,800	9,750					

[a] Shut down at Montague.

Daily discharge, in second-feet, of the Penobscot River at the Sunk Haze Rips, near Costigan, Me., for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9,500	36,000	47,600	40,300	59,400	34,300	11,900	14,100	5,950
2	10,000	35,800	47,500	39,600	54,800	30,300	12,200	13,550	5,950
3	10,500	33,700	45,600	41,300	54,100	36,300	11,900	12,900	5,950
4	11,700	32,200	44,400	44,500	61,200	41,600	11,300	12,700	5,950
5	11,900	31,700	42,300	46,600	72,500	38,200	11,700	12,400	6,100
6	11,200	31,800	41,400	43,800	74,700	34,700	12,500	12,400	6,950
7	11,000	31,500	39,400	42,600	69,900	32,300	12,800	12,050	6,800
8	10,000	31,000	37,700	45,300	66,900	30,300	12,800	12,050	6,250
9	10,150	30,000	36,500	48,800	63,600	27,400	13,200	12,050	5,800
10	10,150	29,200	35,100	44,500	63,000	24,200	14,100	12,050	5,400
11	10,150	27,200	33,600	48,800	61,700	24,200	14,100	12,050	3,140
12	12,600	26,200	32,650	36,600	58,000	23,900	14,100	13,400	3,270
13	13,600	27,150	31,100	38,000	53,400	22,300	14,400	13,200	3,100
14	13,150	29,800	30,500	42,600	49,400	22,000	13,900	12,700	3,270
15	12,750	43,000	29,800	44,500	50,100	18,400	14,600	12,400	3,350
16	12,200	51,000	29,200	46,100	54,100	19,000	14,000	13,400	3,250
17	11,950	52,400	34,800	48,100	50,700	17,500	11,900	12,400	3,050
18	12,400	49,900	44,100	49,400	50,800	14,600	13,200	12,050	3,020
19	12,200	47,300	33,200	54,800	48,800	13,600	16,900	11,900	2,800
20	11,800	45,000	32,500	62,400	54,100	12,600	21,400	11,700	2,620
21	11,850	43,000	62,700	62,000	62,400	10,500	18,700	11,200	2,880
22	12,600	39,700	62,500	75,100	55,700	9,700	14,400	10,450	.....
23	13,600	38,300	61,300	74,700	61,700	12,200	12,900	9,000	.....
24	14,850	35,700	59,500	71,400	60,000	10,150	11,300	7,650	.....
25	15,650	34,800	58,000	69,600	57,800	9,400	11,300	6,350	.....
26	16,300	38,300	55,500	67,500	55,000	8,300	12,200	4,850	.....
27	19,000	44,400	54,800	65,300	50,800	8,150	15,100	6,600	.....
28	27,500	47,300	51,500	61,700	49,800	7,800	15,100	6,450	.....
29	32,000	.....	48,100	59,500	47,100	9,000	14,800	6,150	.....
30	33,500	.....	44,500	56,800	44,200	10,150	14,600	5,950	.....
31	35,400	.....	41,300	.....	39,900	.....	13,550	6,200	.....
Mean	14,876	37,262	43,828	52,407	56,632	20,435	13,769	10,722	4,507

A record of the flow of the river at Milinoket has been kept during the last two years, but the results are not yet ready for publication.

The only extended rainfall record in the basin is that for Orono, showing 46 inches yearly average for the period 1871 to 1891. A record of the rainfall at Milinoket has been kept since 1899. During the summer of 1901 the United States Geological Survey established a rain gage at Wytopitlock, in this basin, with the idea of obtaining information as to the precipitation nearer the headwaters of the stream. A gaging station was also established at Montague, on the main stream, where records of gage heights are made daily, and current-meter measurements of the discharge as often as required to construct a reliable rating curve. From these data the flow of the river on each day of the year can readily be computed.

KENNEBEC RIVER.

DRAINAGE BASIN.

Kennebec River is one of the best streams in the United States for the development of water power. Its basin lies between those of the Androscoggin and the Penobscot, and extends from the Canada line to the ocean. (See Pl. V, p. 28.) The basin measures 150 miles in length, and varies in width from 50 to 80 miles in the main portion, embracing

a total area of 6,330 square miles. Of this area 1,250 square miles are tributary to Moosehead Lake. The general elevation is less than that of the Androscoggin Basin, though near the center of the area Saddleback, Abraham, and Bigelow mountains rise as isolated peaks to elevations higher than any mountains in the State except Katahdin.

The river rises in Moosehead Lake, though its headwaters are collected by Moose River, Roach River, and a number of smaller streams rising in the hilly, forested areas lying to the east and west of that lake. Near Moosehead the hills and highlands are well back from the lake, leaving a great open plain. The northern part of the drainage basin is broken by offsets from the White Mountains. Nearly the whole of the upper portion of the drainage area is forest covered and in its original wild state. Below the outlet of Moosehead Lake into the Kennebec the hills close in upon the river, forming a narrow, rocky chasm, with steep and precipitous sides. From Moosehead Lake to The Forks the river is a torrent, falling over a rocky bed 500 feet in a distance of 23 miles. At The Forks the waters of Dead River, which rises near the western boundary of the State at an elevation of about 2,000 feet, are joined to the main stream. Below this junction the river flows through a broad valley, with gentle slopes upon either side, still covered to some extent with forest growth, but largely cleared and with occasional cultivated farms. About 60 miles from the coast the hills again rise, though not to a considerable height. There are on the river a number of large falls, which have been developed by the construction of dams and are now used for sawmills, pulp mills, and cotton mills. These will be described later.

The prevailing rock in the northern part of the basin is slate, with a belt of sandstone to the west and a district of granite to the east of Moosehead. South of Bingham mica-schists run into the clay slate in spots, and elsewhere into gneiss, but (except where broken by intrusions of granite, as at Hallowell and Augusta), the slate prevails as far as Gardiner. Below the latter city gneiss predominates, with stretches of mica-schists on the east bank. The surface materials are finely pulverized, and water-retaining sands and gravels are more abundant in the northern part, succeeded by a greater proportion of loam and clay to the southward.

The areas of the drainage basins of the river and its principal tributaries are given in the following table:

Drainage areas of Kennebec River and principal tributaries.

River.	Locality.	Drainage area.
		Sq. miles.
Kennebec	Outlet of Moosehead Lake	1,250
Do	Immediately below mouth of Dead River	2,570
Do	Carritunk Falls	2,900
Do	Madison	3,330
Do	Norridgewock	4,030
Do	Somerset Mills, Fairfield	4,380
Do	Waterville above mouth of Sebasticook River	4,410
Do	Waterville below mouth of Sebasticook River	5,470
Do	Augusta	5,770
Do	Head of Merrymeeting Bay	6,330
Moose	Outlet into Moosehead Lake	660
Dead	Mouth	1,000
Sandy	Farmington	340
Do	Mouth	650
Sebasticook	do	1,060
Messalonskee	do	205
Cobbosseecontee	do	230

The United States Geological Survey now maintains gaging stations on the river at The Forks and at North Anson.

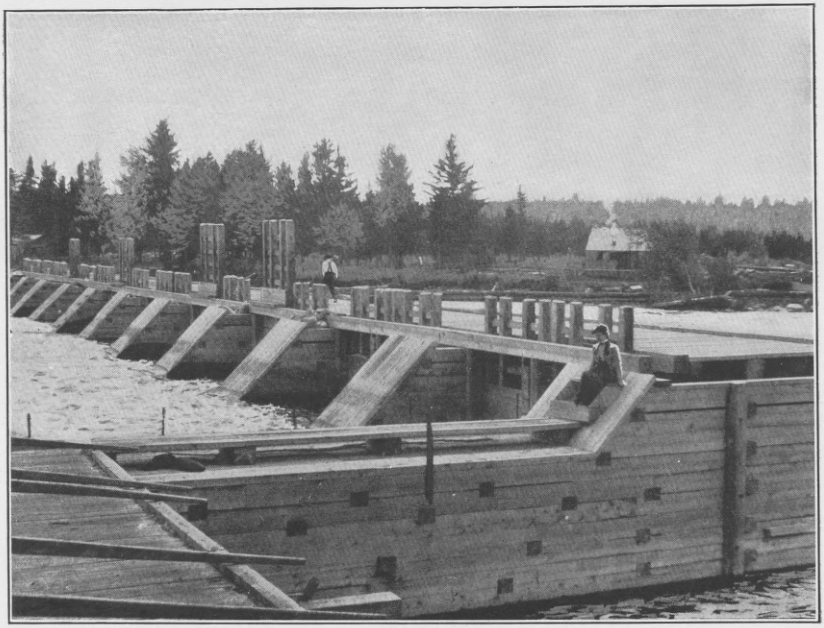
LAKE STORAGE.

Moosehead Lake, with an area of 120 square miles, forms about one-third of the whole lake surface in this basin. The other lakes are small, not one exceeding 10 square miles in area, yet in the aggregate the tributary lake surface amounts to nearly 360 square miles, according to Wells, distributed as follows:

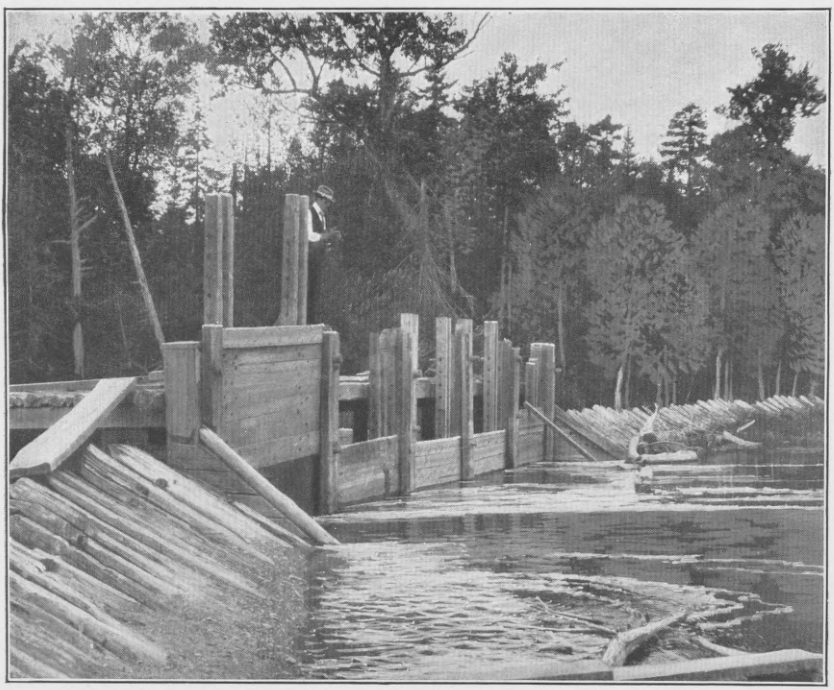
Surface areas of principal lakes and ponds in the Kennebec Basin.

Tributary to—	Sq. miles.
Messalonskee River	27.45
Sandy River	10.10
Carrabassett River	10.20
Dead River	24.75
Moose River	31.60
Sebasticook River	48.30
Wesserunsett River	5.35
Kennebec River at mouth of Moosehead Lake	120.00
Kennebec River at sundry points above Augusta	53.25
Kennebec River below Augusta	25.85
Total	356.85

Despite the excellent natural facilities offered by the basin, the storage has been but imperfectly developed, and that controlled is not employed in the manner most favorable to water-power interests. There is a natural conflict in this matter. For the purposes of log



A. HEAD GATES AT EAST OUTLET OF MOOSEHEAD LAKE.



B. WEST OUTLET OF MOOSEHEAD LAKE.

driving it is desirable to open the gates at the lakes in the spring and early summer, when the normal flow of the stream is already large, so as to flush the logs down to the mills (see Pl. VIII, *A*); while the economical use of stored water for power requires it to be held back in the lakes until midsummer and gradually drawn down from that time through the fall and winter. Moosehead Lake fills during the winter and spring largely, with the melting of the snow, the last of which is usually wasted and forms part of the freshet flow. Between about May 15 and June 1, when logs in sufficient numbers arrive at the lake dam, usually about three days after the ice leaves the lake, the outlet gates are opened, and from that time water is steadily drawn.

An association of manufacturers upon the river has been chartered under the name of of the Kennebec Water Power Company, with a view to the systematic development and control of the storage of the basin. This company and the Kennebec Log Driving Company have made a number of improvements on the river, such as blasting and clearing out the channel of the East Branch, by which means they have been able to drive the logs with less water. While formerly from 5,000 to 6,000 cubic feet per second were used, logs are now driven with from 3,000 to 4,000 cubic feet. This enables them to reserve from 4 to 4½ feet of water in the lake after the drive has reached Augusta, while formerly only 2 feet were left in the lake. The total amount expended by the Kennebec Water Power Company during the last four or five years for improvements and surveys of the Kennebec watershed was $27,259.58. They gave $20,000 to the Kennebec Log Driving Company as their part of the expense of rebuilding the dam at Moosehead Lake. At present the storage in the lake is controlled by the Kennebec Log Driving Company, but after the drive the control of the water is put into the hands of a member of the Kennebec Water Power Company.

The dams at the two outlets, known respectively as the east and west outlet, are of log crib work, filled with stone, and buttressed by heavy piers of similar construction. (See Pl. VII, *A* and *B*.) Nominally the dams have raised the lake surface 7½ feet above the original low-water level, but it can not now be drawn much lower than within a foot of that level, and the actual yearly range between high and low water is from 5½ to 6 feet. The tributary drainage is not entirely controlled, and a large wastage past the dams occurs nearly every year.

The dam at the east outlet has been rebuilt recently and is now in excellent condition. A plan is in contemplation to raise it 2 feet, thereby greatly increasing the storage of the lake. This additional storage could be used for running the logs in the spring and early summer. and the remainder would be available for augmenting, for

manufacturing purposes, the low-water flow. A careful survey of the lake shores has been made by the Kennebec Water Power Company, and flowage maps have been prepared showing the new lake shore if the dam be raised 2 feet. The shore in most places rises rather rapidly, so that the water will not extend far over the land, yet in the aggregate the flooded areas will be large and the project expensive. The expense is considered justifiable, however, owing to the great increase that would take place in the value of the water powers below.

WATER POWERS.

The sources of the streams forming the Kennebec are at elevations of from 1,800 to 3,000 feet, while Moosehead Lake is 1,023 feet above tide level. The distance from the source of Moose River to the sea is 227 miles, following the stream, while from Moosehead Lake to tide water at Augusta the distance is 112 miles. This gives a mean descent of 9.1 feet to the mile throughout the water-power portion of the river, which is a greater fall than any other large river of the State has concentrated in a proportional distance. Elevations at various points along the river are given in the following table:

Fall in Kennebec River.

Locality.	Distance from mouth of river.[a]	Height above mean tide.	Fall between points.	Distance between points.	Average fall per mile between points.	Authority.
	Miles.	*Feet.*	*Feet.*	*Miles.*	*Feet.*	
Canadian Pacific Railway crossing at outlet of Moosehead Lake.	142	[b]1,034				P. Alex. Peterson, chief engineer Canadian Pacific Railway.
			720	56	12.8	
Somerset Railway crossing at Carritunk Falls.	86	[c]314				John Ayer, president Somerset Railway.
			69	11	6.3	
Somerset Railway crossing at Madison.	75	[c]245				Do.
			98	8	12.2	
Somerset Railway crossing at Norridgewock.	67	[c]147				Do.
			81	22	3.7	
Maine Central Railroad upper crossing at Waterville.	45	[d]66				H. C. Robinson, assistant engineer Maine Central Railroad.
			66	19	3.5	
Augusta	26	0				

[a] Measured on Colton's map of Maine.
[b] Canadian Pacific Railway levels (high water 1,038.6; low water 1,033.6).
[c] Adjusted for water surface above dam and for mean tide from profile elevation of Somerset Railway.
[d] Adjusted for water surface from elevation of track, 87 feet above mean tide.

From Moosehead down to tide water the river offers many favorable locations for power development. At seven places the fall is already utilized, and there are several other places where economic developments could be made. The chief hindrance to improvements has been the lack of transportation facilities, and this feature has

not yet been entirely overcome. The river is navigable from its mouth to Augusta, a distance of 40 miles, and a railroad follows the stream as far as Bingham, 20 miles south of The Forks, having east and west connections at Waterville. About 300 yards below the east outlet of Moosehead Lake the Canadian Pacific Railway crosses the river. The stretch of country between Bingham and Moosehead, about 43 miles, is without any means of transportation. From The Forks north there is hardly what might be called a roadway, a trail through the forest being the only connection with Moosehead. It is, however, probably only a question of time when the railroad will be pushed farther north, giving transportation to power plants which in all probability will be established near the headwaters of the river.

At the east outlet there was formerly a small sawmill utilizing the fall at the outlet dam, but when (in 1890) a new wooden dam was constructed a little farther downstream the sawmill was abandoned.

Where the river leaves Moosehead Lake it is a swift-flowing stream about 300 feet in width, with rough, rocky bottom and banks. For about 4 miles the character of the stream remains much the same, the aggregate fall in that distance being 93 feet. The river then widens out into Indian Pond, a sheet of water about 4½ miles long and a half mile wide. At the head of this pond the stream from the west outlet of Moosehead Lake joins the main river. The discharge of this outlet is comparatively small and is controlled by a small wooden dam (shown in Pl. VII, *B*), with gates for regulating the flow. Below the pond the river has a continuous and decided fall for a distance of about 7 miles through a rocky gorge with side walls from 20 to 50 feet high. Throughout this portion of its course the water falls over many precipitous ledges, and the river has the characteristics of a mountain torrent. There is a large amount of power that could be utilized in this 7-mile stretch, the flow and fall being large, the sites favorable for the construction of dams, and good building materials at hand. The chief disadvantage is the lack of transportation facilities, though this could be remedied by the extension of the Somerset Railway north from Bingham.

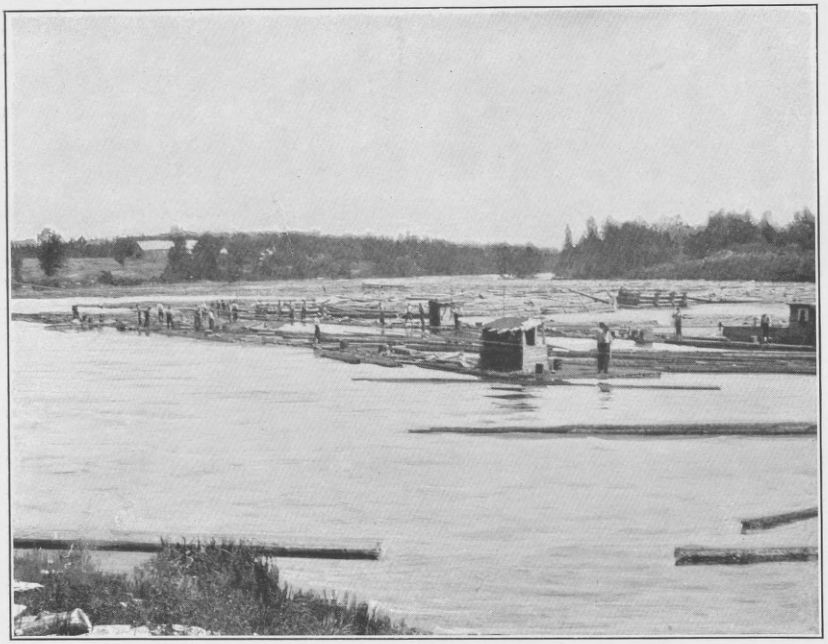
As has been stated, there is a fall of about 500 feet between Moosehead Lake and The Forks, a distance of 23 miles. Between The Forks and Carritunk Falls there is a fall of about 200 feet; from Carritunk Falls to Madison, a distance of 11 miles, the river falls about 80 feet; from Madison to Norridgewock, a distance of 13 miles, the fall is about 100 feet; from Norridgewock to tide water the average fall is much less, being about 3½ feet to the mile, and largely concentrated at a few points, partly by nature and partly by dams built across the river, as at Skowhegan, Shawmut, Fairfield, Waterville, and Augusta.

The seven powers that are at present utilized are between Carritunk Falls and Augusta, and aggregate 24,000 horsepower, covering about 142 feet of the 314 feet total fall of the river between those points. The uppermost of these powers is that of the International Paper Company, at Carritunk Falls. That company has about 3,500 horsepower of turbines installed. There is a natural cascade at this point, with a pitch of 28 feet through a narrow gorge, above and below which the river widens out. The dam was built in the winter of 1891, and makes the available fall 30 feet.

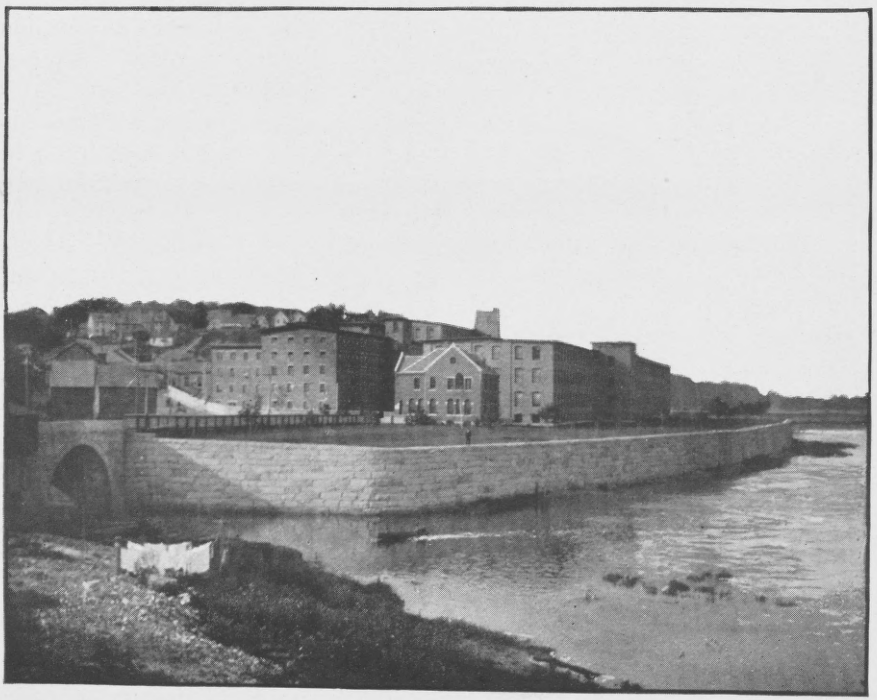
Passing downstream the next utilized power is at Madison, where during normal stages of the river a head of 20 feet is utilized. The water wheels on this power aggregate about 3,000 horsepower, although that amount is not available at all times, owing to lack of water. At present several concerns are using power at Madison, viz: The Great Northern Paper Company, manufacturing newspaper and sulphite fiber; the Indian Spring Woolen Company and the Madison Woolen Company, both manufacturing woolen goods; and the Madison Pumping Station. The amount of power used by the Great Northern Paper Company varies somewhat, according to the flow of the river. They use about 1,200 electrical horsepower at all times, and have grinder units installed requiring a maximum of about 2,000 horsepower. The electric plant is run throughout the year at full capacity, while the grinders probably average about half power throughout the year. The woolen companies are supposed to use about 400 horsepower each.

There is a natural fall of more than 80 feet, in pitches and rapids, in the river near Madison, so that only a small portion of the power available in that locality is employed. The Great Northern Paper Company has prepared plans for developing two falls just below the town, one of 20 feet and the other of 43 feet. The 20-foot fall is at Old Point, near the Norridgewock town line, and will be used entirely for electrical power. A dam about 640 feet long will be built, and sufficient apparatus installed to generate 3,000 horsepower. At the 43-foot fall a masonry dam having a height of from 10 to 30 feet and a length of crest of 850 feet will be built. This power will be used entirely for grinding wood pulp. Wheels to generate 13,000 horsepower will be installed, with the idea of storing the product during high water and running whatever part of the plant is possible during low water.

The next dam is at Skowhegan, where the power is controlled by the Skowhegan Water Power Company. The fall is 17 feet, and 28 water wheels of an aggregate capacity of 5,100 horsepower are in use at the various works. Of this amount 2,900 horsepower is employed in pulp manufacture, 750 horsepower exclusively for electric lighting and power, and the remainder by grist, saw, planing, and woolen



A. LOG BOOM ON KENNEBEC RIVER ABOVE MADISON FALLS.



B. COTTON MILLS OF EDWARDS MANUFACTURING COMPANY AT AUGUSTA.

mills, and sash-and-blind and scythe factories, some of the turbines operating factories by day and electric lights by night.

At Somerset Mills, in the town of Fairfield, there is a log dam 12 feet high and about 1,300 feet long, furnishing power for two sawmills and a planing mill. The dam and the sawmills are owned by the Lawrence, Newhall & Page Company. They have eight or ten wheels, developing 1,000 horsepower. At the same town there is a fall of 10 feet utilized by pulp mills, an electric-light plant, a furniture factory, and a woolen mill. This dam is owned and controlled by the Fairfield Junction Mills and Water Power Company.

Water power on the Kennebec is developed more extensively at Waterville and Winslow than elsewhere on the river. The upper privilege, formerly known as the College Rapids, is utilized by the Hollingsworth & Whitney Company, paper manufacturers, and embraces a fall of 20 feet, operating 46 turbines of an aggregate capacity of 6,358 horsepower. The lower privilege, at Ticonic Falls, is owned by the Lockwood Company, at whose cotton mills about 2,400 horsepower is used. A dam 750 feet long raises the river surface 7 feet, and a further natural fall of 13 feet over a slate ledge gives a total head of about 20 feet.

At Augusta, the head of tide water, a crib-work dam 17 feet high and 950 feet long has been constructed, ponding water 17 miles upstream, or to Waterville. On the west bank the Edwards Manufacturing Company uses about 2,500 horsepower in its cotton mills (shown in Pl. VIII, *B*), while on the east bank 1,500 horsepower is employed by the Cushnoc Paper Company and the Kennebec Light and Heat Company, the latter furnishing the municipal lighting for Augusta, Hallowell, Gardiner, and Togus. The fall is affected somewhat by the rise of the tide.

FLOW.

The natural flow of the Kennebec is somewhat disguised by the regulation at the Moosehead Lake outlet. The storage capacity of that lake is very large, and the effect upon the flow of opening and closing the gates is marked. If this regulation were designed entirely to benefit the power plants the flow of the river could be made far more constant than at present. The fact that the water is required for log driving perhaps gives a great surplus to the manufacturers in the log-driving season, but draws the lake down so that the available storage is much lessened at the beginning of the dry season. Raising the dam at the Moosehead Lake outlet 2 feet, as contemplated, would furnish a supply for log-driving purposes and permit sufficient storage to greatly increase the low-water flow of the river.

An intelligent study of the possibilities of storage, however, requires that data should be available showing the amount of rainfall, the size

and character of the drainage area, and the variations in the flow of the river. Unfortunately, in Maine very little attention has been paid to the determination of the rainfall. In the Kennebec Basin a rainfall gage has been maintained at Fairfield and the records from this gage have been used in the tables on the following pages, but absolutely no records have been obtained on the headwaters of the main river or its tributaries. During the summer of 1901 a rain gage was established at Kineo, on Moosehead Lake, by the Kennebec Water Power Company, and in the fall of the same year rain gages were placed by the United States Geological Survey at The Forks, at Roach River, at Northeast Carry, and at Jackman, and gaging stations were established at The Forks and at North Anson on the Kennebec, at The Forks on Dead River, at North Anson on Carrabassett River, and at Roach River on Roach River.

Topographic maps of Kennebec River and its drainage basin from the coast as far north as Skowhegan have been made by the Geological Survey, but unfortunately the headwaters have not yet been surveyed. This topographic work, however, will be pushed northward as rapidly as the appropriations permit.

The only long-continued observations of the volume of the river are those which have been made at Waterville, by the Hollingsworth & Whitney Company, who kindly furnished the results for publication herein. The works of that company are above the mouth of Sebasticook River. The tributary drainage area of the Kennebec at that point is about 4,410 square miles, as measured on Colton's map of Maine. Of the figures for discharge, those prior to June 20, 1893, are from computations by weir formula of the quantity flowing over the dam; those subsequent to June 20, 1893, at which time the mill began running, are from computations of the flow through the turbines, based upon assumed ratings, to which has been added any excess passing over the crest of the dam, the length of which is 734 feet. The figures really represent the flow at 12 o'clock noon of each day, that hour having been chosen, after investigation, as a time when the flow is least affected by storage at dams upstream, and as giving most nearly the average for the day.

On December 15, 1901, occurred one of the highest floods known on the Kennebec. The maximum discharge of the river at Madison was computed by Mr. H. S. Ferguson, C. E., and found to be 105,000 cubic feet per second. The length of the present masonry dam is 550 feet. The depth of flow over the crest during the height of the freshet was 14½ feet. At 8 a. m., Sunday, December 15, the water was just flowing over the crest; at midnight that day it reached a maximum height of 14½ feet, and by 10 a. m. of the next day it had dropped to about 9 feet on the crest of the dam. It is estimated that the drainage area at Madison is about 2,850 square miles, and it is reported that during

the freshet most of the gates at the Moosehead Lake outlet were closed.

The results of the measurements at Waterville are given in the following tables and are shown graphically in figs. 1 to 5, inclusive. An inspection of the tables will show that while the dry-weather flow of the river is not nearly so low nor the floods so violent as on most Atlantic streams, yet there are large spring rises, due to the melting of the snow and to spring rains, which the capacity of the lakes as now artificially controlled is not sufficient to store. The rises are frequently sudden, as can be seen by the tables. Thus, the discharge on May 17, 1893, was 30,700 cubic feet per second; on the following day it was 83,500 cubic feet per second; and on the next day it dropped to 46,100 cubic feet. Again, in April, 1895, the discharge rose from 24,000 cubic feet per second on the 14th to about 86,000 cubic feet per second on the 15th, being nearly quadrupled. It will be seen that this river seldom has a discharge at Waterville of less than 1,100 cubic feet per second, or about 0.25 cubic foot per second per square mile.

Daily discharge, in second-feet, of Kennebec River at Waterville, Me.

[Drainage area, 4,410 square miles.]

1892.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				3,530		11,840	17,355					
2				4,730	7,920		20,030					
3				10,260		11,840						
4				19,100	6,310		29,985					
5				25,250								
6				22,980	8,950	11,515						
7				28,150								
8				24,830		8,200						
9				22,810	9,660							
10						7,925						
11				18,090	5,900							
12												
13				11,195	7,650	7,375						
14											[a]545	
15				8,660		7,100					[a]395	
16											[a]670	
17					6,940	8,490					[a]639	
18				6,940	6,580						[a]568	
19											[a]961	
20				6,465	5,310	10,260					[a]1,449	
21											[a]1,488	
22			2,470	7,530		17,355					[a]1,112	
23				9,835	7,215							
24			2,430			19,640					[a]958	
25			2,250		13,750	21,615					[a]1,399	
26			2,220								[a]2,296	
27			2,000	13,160	10,750	19,250						
28			2,325			19,640						
29			2,390	8,780		29,990						
30			2,730		12,160	20,030						
31			3,080									

[a] These figures are for the year 1891. The closing of gates at Moosehead Lake is said to have caused the small discharge here recorded.

Daily discharge, in second-feet, of Kennebec River at Waterville, Me.—Continued.

1893.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	2,350	2,500	4,100	21,700	13,200	10,840	1,940	2,490	------	1,980	2,780
2	------	2,250	2,500	4,250	21,200	16,250	------	2,330	2,140	1,980	1,980	2,580
3	------	2,200	2,450	4,500	27,600	15,200	9,990	2,380	------	1,980	1,980	------
4	------	2,100	2,400	4,400	24,700	------	11,230	2,360	1,890	1,710	1,980	------
5	------	2,100	2,400	3,700	60,500	13,800	8,840	2,290	1,890	1,980	------	1,440
6	------	2,200	2,400	3,700	46,500	15,250	9,740	------	1,890	1,980	1,980	1,440
7	------	2,300	2,350	3,600	36,700	16,250	8,410	2,240	2,260	1,980	2,250	1,440
8	------	2,250	2,350	3,600	30,200	18,200	8,410	2,210	2,360	------	1,980	1,440
9	------	2,100	2,325	6,400	26,300	23,500	------	2,360	2,680	1,980	1,980	1,440
10	------	3,000	2,300	9,200	25,200	15,900	8,260	2,360	------	1,980	1,980	------
11	------	2,400	2,300	12,400	27,000	------	8,710	2,290	2,160	1,710	1,980	1,440
12	2,000	2,550	2,300	15,000	31,700	16,250	6,510	2,290	2,380	1,440	------	1,440
13	2,100	2,600	5,400	16,500	31,300	23,200	6,410	------	2,190	1,780	1,980	1,440
14	2,300	2,550	8,000	16,500	54,500	20,500	6,040	2,240	2,410	1,980	1,980	1,440
15	2,500	2,500	11,300	18,200	43,100	18,200	5,540	2,290	2,340	4,000	1,980	1,440
16	2,600	2,400	7,400	16,500	34,100	15,200	------	2,430	2,175	3,050	1,980	1,440
17	4,800	2,300	6,300	14,100	30,700	13,200	4,840	2,210	------	2,550	1,980	------
18	5,000	2,200	6,100	14,000	83,500	13,200	4,490	2,150	1,710	2,550	2,250	1,710
19	4,200	2,100	5,700	14,100	46,100	11,200	3,660	2,290	1,710	1,980	------	1,710
20	3,200	2,200	5,600	16,300	34,500	11,000	3,270	------	2,200	2,250	2,250	1,440
21	2,100	2,350	4,600	14,500	------	12,000	3,590	2,240	1,710	1,980	2,520	1,440
22	1,900	2,450	3,900	12,300	24,300	14,480	3,490	2,205	1,710	------	2,250	1,440
23	2,100	2,350	3,600	13,800	22,800	13,640	------	2,180	1,710	1,980	2,550	1,440
24	2,200	2,200	3,600	15,800	21,200	11,840	3,170	2,153	------	1,980	2,480	------
25	2,300	2,400	4,000	14,500	19,800	------	2,830	2,295	1,710	3,380	1,980	------
26	2,200	2,400	4,400	14,600	17,000	14,270	2,440	2,390	1,710	2,450	------	1,440
27	2,200	2,450	4,400	14,200	16,300	14,000	2,380	------	1,980	1,980	1,980	1,590
28	2,300	2,500	4,300	14,600	15,200	15,100	2,360	2,340	1,980	3,630	2,080	1,440
29	2,300	------	4,200	14,800	14,550	14,600	2,240	2,310	1,710	3,530	3,980	1,590
30	2,350	------	4,100	19,800	13,600	13,500	------	2,230	1,980	3,280	3,630	1,590
31	2,400	------	4,000	------	13,900	------	2,440	2,430	------	2,280	------	------
Mean	2,650	2,350	4,180	11,660	30,520	15,290	5,770	2,270	2,040	2,330	2,230	1,580

1894.

1	1,470	1,910	1,740	------	15,650	11,190	------	3,305	2,253	2,181	3,806	1,570
2	1,640	1,910	1,740	4,496	14,510	12,930	7,030	3,240	1,125	1,923	7,295	------
3	1,640	1,740	1,740	4,496	14,090	------	6,860	3,143	2,312	1,915	5,619	2,187
4	1,640	------	------	4,370	13,220	12,930	------	3,218	1,871	1,930	10,512	2,194
5	1,640	1,910	2,010	4,370	13,220	10,400	10,020	------	2,207	1,896	9,486	2,213
6	1,640	1,910	1,740	5,473	------	9,070	8,570	3,087	1,824	1,655	7,381	1,869
7	------	1,740	1,910	4,720	12,280	9,070	7,665	3,019	2,209	------	5,606	2,193
8	1,640	1,740	2,370	------	10,100	8,520	------	3,019	2,185	1,897	4,651	2,128
9	1,470	1,740	3,040	5,278	8,550	6,910	7,055	3,285	1,140	1,913	3,937	1,245
10	1,640	1,740	4,643	5,655	7,226	------	6,336	3,045	2,293	1,913	3,739	1,937
11	1,640	------	------	5,950	7,050	5,900	6,674	3,050	2,034	5,553	3,040	1,211
12	1,470	1,740	5,390	6,980	6,110	------	6,674	------	2,818	6,738	3,636	1,694
13	1,640	1,740	5,390	7,170	------	6,280	6,674	3,250	2,280	5,017	3,476	1,819
14	------	1,740	6,220	6,980	5,840	5,900	6,336	3,125	2,309	8,387	2,782	2,386
15	1,470	1,740	5,580	------	6,820	6,010	------	3,005	2,341	9,036	2,500	2,600
16	1,640	1,740	4,460	12,150	7,410	5,900	6,674	3,010	------	3,829	2,661	2,275
17	1,640	1,740	4,855	13,310	9,935	------	6,046	3,110	2,183	7,527	2,489	2,513
18	1,470	------	------	20,640	9,935	------	5,765	3,060	2,136	6,418	2,152	2,466
19	1,640	1,740	4,140	21,760	10,915	5,520	5,100	------	1,883	5,088	2,631	2,331
20	1,640	1,740	5,405	22,910	------	9,565	5,550	3,230	1,885	4,253	1,984	2,326
21	------	1,760	3,802	26,860	13,540	10,055	4,885	3,050	12,102	3,231	2,446	2,205
22	1,640	1,760	6,660	------	8,250	5,490	------	2,915	6,659	3,730	2,502	2,208
23	1,640	1,810	6,395	35,280	6,100	6,265	3,680	2,825	4,673	3,576	2,495	1,229
24	1,640	1,810	5,215	33,680	6,360	------	3,565	3,070	4,143	3,315	2,487	1,912
25	1,910	------	------	29,130	6,580	3,930	3,670	2,555	2,646	2,549	2,786	------
26	1,910	1,760	4,855	25,210	10,560	3,781	3,830	------	2,571	2,605	2,484	------
27	1,910	1,740	4,184	21,980	------	3,710	3,830	2,855	2,509	2,854	2,461	1,831
28	------	1,740	4,180	20,680	8,690	10,480	3,830	2,494	2,378	------	2,515	1,770
29	1,640	------	3,895	------	7,480	8,985	------	2,615	1,918	2,859	1,444	1,657
30	1,646	------	3,620	17,450	7,960	8,070	3,415	2,294	467	2,458	1,645	904
31	1,640	------	3,510	------	10,000	------	3,345	2,400	------	2,452	------	1,227
Mean	1,640	1,780	4,020	14,680	9,570	7,790	5,720	2,970	2,740	3,750	3,760	1,930

Daily discharge, in second-feet, of Kennebec River at Waterville, Me.—Continued.

1895.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,135	2,214	1,685	2,176	13,227	9,818	5,042	3,153	1,792	1,106	1,081	5,904
2	1,599	2,208	1,687	2,205	11,967	9,314	4,315	3,062	2,867	1,149	1,347	4,682
3	1,655	1,733	1,252	2,406	11,461	8,408	4,278	3,063	2,560	1,130	1,870	8,378
4	1,664	2,174	1,720	2,638	12,172	7,979	3,784	1,576	2,226	1,110	1,421	5,842
5	1,608	2,444	2,229	6,164	11,934	7,364	4,062	3,015	2,212	1,152	2,201	3,519
6	1,780	2,077	2,145	7,691	12,584	7,370	3,844	2,738	2,200	.....	1,946	2,723
7	1,678	1,854	1,956	9,286	12,764	7,425	4,429	2,610	2,155	1,128	1,708	3,273
8	1,947	1,718	1,951	9,325	10,917	7,623	4,499	2,816	1,438	1,104	1,657	2,301
9	1,894	1,622	1,949	24,407	12,074	6,166	4,039	2,580	2,250	1,126	1,426	3,393
10	1,896	1,397	1,368	54,192	7,848	6,418	4,072	2,382	2,502	1,356	5,125	3,089
11	1,889	1,983	1,683	27,999	9,630	5,852	3,993	1,529	2,256	1,109	9,595	1,105
12	1,864	1,946	1,920	20,858	7,920	6,454	3,934	2,690	2,209	1,121	8,351	2,598
13	1,273	1,943	1,932	19,304	11,352	4,854	3,731	2,435	1,996	.....	6,279	2,278
14	2,403	1,967	1,946	24,061	16,175	5,887	3,658	2,405	1,970	1,185	3,882	2,524
15	2,441	1,648	2,236	86,201	12,878	6,925	3,767	2,160	1,150	1,141	3,869	1,747
16	2,481	1,950	2,224	70,381	12,121	6,592	3,631	2,433	1,736	1,134	4,972	2,545
17	2,490	579	1,566	43,408	9,842	6,156	3,508	2,118	1,710	1,250	6,455	2,069
18	2,509	2,112	2,224	34,708	7,895	6,121	3,546	857	1,987	1,546	5,695	2,621
19	2,439	1,708	2,194	31,068	8,668	5,616	3,512	2,681	1,721	1,587	4,591	1,928
20	1,817	1,689	1,937	31,562	7,807	5,905	3,232	2,072	1,741	.....	4,169	2,180
21	2,439	1,361	1,965	31,363	5,863	5,641	3,257	2,357	1,707	1,353	10,949	2,536
22	2,304	1,656	1,946	29,572	5,449	4,497	2,617	2,240	1,050	1,422	11,179	3,321
23	2,332	1,606	1,977	28,511	5,515	5,075	3,151	2,199	1,139	1,428	6,694	11,026
24	2,290	.....	1,627	23,707	8,261	5,046	2,875	2,722	1,387	1,432	5,124	9,147
25	2,333	1,629	2,241	20,348	8,037	5,670	2,863	1,658	1,167	1,372	5,632	6,136
26	2,319	1,676	2,314	18,931	6,919	6,216	2,590	4,284	1,155	1,399	4,804	5,162
27	1,706	1,714	2,769	15,489	7,533	6,290	2,552	5,089	1,104	.....	9,383	5,792
28	2,433	1,927	2,600	15,929	8,119	5,708	2,096	4,890	1,145	1,115	15,900	26,673
29	2,198	.....	2,418	10,853	6,109	5,690	2,671	3,450	.....	1,355	11,623	16,148
30	2,439	.....	2,459	13,216	4,868	4,955	2,930	3,080	1,115	1,385	9,372	14,590
31	2,127	.....	1,898	.....	8,982	.....	2,678	3,102	.....	1,081	.....	19,713
Mean	2,040	1,800	2,000	23,930	9,580	6,430	3,520	2,690	1,780	1,250	5,610	6,030

1896.

1	3,281	2,643	6,257	5,527	29,468	7,491	4,811	3,730	2,643	2,870	3,238	8,049
2	21,881	1,292	111,246	5,861	26,601	11,004	4,374	2,696	2,611	2,975	4,259	6,844
3	17,367	2,717	52,691	6,647	25,207	6,846	4,236	3,595	1,772	3,734	4,023	5,730
4	11,482	2,522	24,810	6,442	18,064	5,891	5,578	3,597	2,577	2,275	3,757	2,200
5	6,708	2,243	13,866	5,782	26,583	5,318	5,249	3,037	2,371	5,249	3,435	2,603
6	4,153	2,236	13,170	5,709	30,879	4,961	11,678	3,044	2,129	4,567	29,865	2,545
7	3,803	2,857	11,862	5,373	29,499	4,343	11,214	3,313	6,903	3,954	23,836	3,312
8	4,329	4,634	10,323	4,998	25,090	4,391	9,685	3,468	7,978	3,277	17,040	2,851
9	2,970	3,962	8,950	5,040	22,228	4,374	8,690	.....	6,094	3,210	15,322	2,870
10	2,971	3,452	9,499	5,199	19,997	5,953	7,149	4,113	4,624	3,166	12,152	2,852
11	3,006	3,140	5,469	6,757	20,249	3,855	6,047	4,737	4,005	2,394	10,028	2,851
12	2,755	3,002	5,226	8,356	21,463	6,252	4,637	4,276	3,668	2,626	11,389	2,938
13	2,970	2,816	6,109	16,221	19,072	5,235	4,844	3,906	1,857	2,617	11,777	2,385
14	2,689	2,967	3,651	11,472	18,994	5,142	4,437	3,695	2,952	2,362	10,962	2,981
15	2,595	2,879	.....	15,989	18,066	4,679	4,289	3,414	3,002	2,388	9,319	2,874
16	2,990	2,193	3,888	46,946	16,696	4,944	4,449	2,566	2,789	2,311	8,426	2,307
17	2,513	2,829	10,129	64,700	17,981	4,549	5,121	3,197	2,336	2,384	7,947	2,272
18	2,736	2,824	3,159	61,270	14,846	4,536	5,125	3,137	2,932	2,016	7,952	1,489
19	1,568	2,758	4,087	57,188	15,227	4,219	4,495	3,178	3,590	2,319	8,130	2,303
20	2,782	2,763	6,699	52,131	13,163	4,710	4,596	3,079	1,733	2,326	7,547	1,870
21	3,000	2,781	12,922	74,469	14,782	5,352	4,391	2,858	4,313	2,352	6,572	2,547
22	2,767	2,771	3,239	60,021	13,215	6,072	4,419	2,747	4,207	4,208	5,222	2,287
23	2,793	2,162	10,025	41,711	3,976	6,655	4,374	2,759	4,147	8,956	3,749	2,047
24	2,542	3,854	7,820	46,693	23,517	6,275	4,258	2,943	3,754	7,804	4,606	1,768
25	2,394	2,812	6,608	40,793	14,220	6,334	4,386	2,990	2,924	7,986	6,185	1,579
26	1,881	2,790	6,637	36,126	4,482	5,817	3,794	2,851	2,969	6,227	6,322	1,506
27	2,499	2,772	7,253	32,729	5,729	5,459	4,215	2,571	2,474	5,388	5,683	1,497
28	2,765	2,558	10,886	30,217	5,117	5,309	3,781	2,410	3,149	2,644	6,169	2,317
29	2,531	2,794	5,945	30,517	4,867	4,200	3,728	2,416	3,148	3,214	8,424	2,063
30	2,473	.....	6,901	30,977	3,192	5,307	3,395	1,625	2,777	2,888	8,432	1,845
31	2,220	.....	5,006	.....	6,092	.....	3,831	2,531	.....	2,891	.....	1,787
Mean	4,304	2,830	13,140	27,400	17,050	5,520	5,330	3,150	3,410	3,664	9,059	2,750

Daily discharge, in second-feet, of Kennebec River at Waterville, Me.—Continued.

1897.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,073	3,587	2,007	6,334	39,001	18,204	8,719	12,975	4,771	2,314	2,911	4,630
2	2,085	3,485	2,950	7,648	34,299	16,780	9,885	13,656	4,357	2,048	2,637	3,825
3	1,650	3,775	2,423	9,075	32,654	17,526	9,531	11,263	4,340	967	6,687	3,754
4	2,318	3,598	2,629	9,635	34,210	17,542	8,512	9,206	3,701	2,532	9,442	3,190
5	3,733	3,348	2,586	11,536	40,730	17,549	7,142	7,796	3,090	2,490	8,628	3,063
6	18,504	3,223	2,522	12,889	36,362	15,756	8,189	7,226	3,865	2,375	7,729	5,968
7	10,210	4,185	4,026	18,329	26,923	16,023	7,410	5,889	3,571	2,158	6,457	6,382
8	5,860	4,305	2,703	21,149	26,610	15,785	7,922	5,761	4,008	1,533	6,443	5,229
9	5,028	5,634	2,285	18,268	24,400	13,801	7,967	4,000	3,973	2,097	5,195	5,172
10	3,793	6,225	2,291	15,458	23,995	12,961	7,270	5,243	3,997	2,100	7,927	4,879
11	3,293	5,933	4,554	16,671	41,196	16,003	6,290	5,849	4,808	2,109	8,133	4,212
12	3,601	5,007	4,230	14,377	41,223	14,962	5,761	7,562	9,689	1,508	7,313	4,048
13	3,084	4,629	5,238	13,999	23,965	13,819	7,256	9,771	5,463	1,788	6,350	5,765
14	2,542	3,897	5,045	14,796	41,284	15,304	45,507	7,112	4,915	6,070	2,789	6,104
15	2,881	4,070	5,387	16,881	38,988	16,003	55,634	6,601	4,864	6,323	4,902	7,153
16	2,715	4,028	4,925	24,426	32,431	14,617	33,770	5,368	4,325	5,528	4,420	13,621
17	2,187	3,848	2,533	34,813	27,453	14,638	26,160	7,776	4,333	3,837	5,913	14,005
18	2,942	3,163	2,025	28,642	23,788	13,344	21,286	11,566	3,239	3,262	7,191	11,381
19	1,918	2,467	2,304	31,734	21,013	11,200	17,067	8,562	3,632	3,287	6,428	7,665
20	2,211	2,480	2,339	32,799	18,843	11,390	12,542	6,755	3,488	2,322	4,391	5,835
21	2,283	3,543	3,167	26,949	17,562	10,649	7,747	7,129	5,043	2,331	4,161	6,799
22	2,222	2,636	2,083	24,087	15,105	7,399	5,218	7,907	8,422	2,326	3,009	5,419
23	2,951	2,427	2,621	24,008	15,448	9,991	8,408	6,616	7,438	2,051	2,703	3,861
24	2,300	2,302	5,547	29,875	14,809	9,095	8,980	5,718	5,838	1,510	2,181	3,839
25	1,953	2,544	5,832	33,605	10,818	8,353	8,925	5,816	4,481	2,140	2,687	3,225
26	1,847	2,877	6,345	42,860	16,539	8,751	10,826	6,280	3,841	2,348	1,889	2,541
27	2,727	2,825	5,992	51,255	21,779	7,590	9,842	6,220	4,555	2,415	6,097	2,563
28	2,252	3,705	5,311	66,907	24,568	7,691	7,950	5,706	4,084	2,973	13,399	2,685
29	2,477	------	4,994	58,745	26,000	8,023	6,734	5,382	2,915	2,008	6,883	3,001
30	4,024	------	5,071	43,797	22,697	8,345	6,405	5,154	2,801	2,344	6,171	2,733
31	3,534	------	5,513	------	20,526	------	11,707	4,364	------	2,600	------	2,699
Mean	3,587	3,705	3,790	25,385	26,943	12,970	13,115	7,298	4,595	2,635	5,702	5,330

1898.

1	2,475	2,539	4,170	20,385	36,048	14,341	4,385	3,790	2,477	2,691	6,382	3,752
2	2,284	2,955	4,188	16,556	39,372	13,776	4,343	2,707	2,489	2,862	5,182	3,740
3	2,222	2,687	5,648	13,871	38,301	10,900	3,440	2,887	2,453	2,180	4,691	3,667
4	2,715	3,090	5,163	12,143	37,358	8,791	3,490	2,833	1,437	1,831	4,115	1,747
5	2,771	2,775	2,997	10,830	37,730	9,846	4,343	2,809	2,510	1,865	3,467	3,336
6	3,431	3,068	4,094	10,150	37,569	10,301	4,272	3,712	2,392	2,119	3,231	3,227
7	1,807	3,475	5,070	7,080	31,580	9,189	4,477	3,252	3,093	1,570	3,880	3,221
8	4,826	2,994	5,033	6,563	29,880	9,098	4,203	4,374	3,073	1,269	3,675	3,262
9	5,434	3,744	4,767	7,472	28,753	12,541	5,464	4,218	3,018	1,150	4,133	2,995
10	4,492	3,154	4,623	10,457	25,636	14,318	1,745	4,017	3,042	961	3,351	2,635
11	3,025	3,829	5,329	15,299	22,059	12,086	4,111	3,048	3,050	1,585	5,332	1,792
12	3,286	3,317	6,752	19,848	21,899	11,322	4,484	3,413	3,057	1,731	5,856	3,268
13	3,240	3,680	8,397	44,854	24,042	11,003	4,267	2,927	2,505	1,585	4,896	2,235
14	3,287	3,912	9,880	47,141	34,332	10,777	3,776	1,130	1,913	1,288	3,332	1,873
15	4,909	4,026	11,534	50,381	32,988	12,514	4,327	3,443	1,480	1,299	3,465	1,888
16	3,717	4,042	12,816	49,415	27,500	11,295	3,994	2,499	1,560	3,665	3,264	1,883
17	3,891	3,764	12,215	47,112	24,756	10,584	3,611	2,590	1,530	6,031	3,490	2,160
18	3,453	3,221	11,918	47,321	23,440	9,478	3,896	2,491	1,570	5,055	3,698	1,723
19	3,460	3,267	12,484	44,700	23,153	9,196	3,938	2,622	1,607	4,454	5,018	2,315
20	3,505	2,885	13,218	39,327	20,592	11,129	3,747	2,526	1,876	3,264	8,798	2,447
21	3,893	3,172	14,580	36,671	19,088	10,855	3,835	913	2,223	2,872	8,935	2,560
22	4,614	3,764	17,177	33,789	18,570	9,950	5,038	3,425	1,851	2,690	8,046	2,274
23	2,542	2,133	16,615	30,792	17,073	8,334	3,871	2,866	1,888	6,036	7,184	2,778
24	2,321	3,437	15,987	34,352	15,277	9,483	3,418	3,425	1,916	6,318	6,007	3,018
25	2,866	4,352	17,812	52,119	15,993	8,864	3,747	2,849	3,689	4,924	7,811	2,489
26	2,032	3,933	17,029	45,520	15,589	7,508	3,879	4,432	5,443	4,288	7,923	2,471
27	3,136	3,653	16,560	38,083	15,639	5,267	3,385	4,218	4,788	6,514	10,037	2,761
28	2,905	4,387	18,928	37,354	14,611	4,326	4,189	3,940	3,581	15,319	3,672	2,464
29	2,727	------	19,762	33,652	16,632	5,689	3,444	3,396	3,778	11,127	2,758	2,499
30	1,738	------	17,711	31,767	16,962	6,715	3,204	3,555	3,247	9,229	3,723	2,067
31	2,607	------	27,432	------	16,298	------	2,832	2,857	------	7,672	------	2,178
Mean	3,213	3,402	11,287	29,883	25,120	9,983	3,908	3,133	2,618	4,047	5,178	2,620

Daily discharge, in second-feet, of Kennebec River at Waterville, Me.—Continued.

1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,529	2,458	3,382	6,411	41,756	13,044	6,115	4,809	1,623	------	1,390	1,456
2	2,202	2,198	3,047	6,214	39,665	12,790	5,024	3,594	2,010	1,443	2,819	1,441
3	2,274	2,187	3,333	6,160	36,589	10,647	5,363	4,442	567	1,665	4,093	747
4	2,159	2,163	3,324	6,017	36,942	11,673	3,178	4,199	1,612	1,415	4,109	2,913
5	2,452	1,580	1,960	6,207	30,922	12,264	5,258	4,498	2,070	1,969	2,995	3,567
6	2,451	2,505	3,331	6,227	30,531	11,123	5,120	4,415	2,082	1,449	3,327	3,196
7	2,449	2,173	3,563	6,423	30,125	10,563	5,076	5,064	2,070	1,476	3,106	2,015
8	1,739	2,071	3,516	7,007	29,447	12,748	5,367	5,195	------	------	2,637	2,070
9	2,757	2,057	3,502	7,541	26,888	12,517	3,936	4,388	2,352	1,215	2,338	1,737
10	2,513	2,152	3,428	9,001	24,803	12,506	5,142	4,128	246	940	2,119	------
11	2,400	2,141	3,357	9,650	22,132	10,738	5,123	4,101	2,635	774	1,698	1,393
12	2,386	2,244	3,302	9,405	20,229	10,278	4,866	3,954	2,067	1,784	------	1,160
13	2,404	2,348	3,353	11,181	18,697	6,039	5,100	2,699	2,340	1,968	1,488	2,022
14	2,436	1,964	3,423	19,700	19,643	7,030	5,950	3,964	2,370	1,391	1,970	5,223
15	1,678	1,844	3,624	23,106	14,886	6,739	5,078	3,538	2,257	492	2,017	4,410
16	2,731	2,392	3,773	38,826	15,099	7,557	4,043	3,213	1,261	1,378	2,053	4,621
17	2,439	2,434	3,501	30,532	17,307	5,913	4,866	3,007	1,298	1,667	1,823	1,861
18	2,631	2,727	3,253	30,312	15,073	6,807	5,232	3,321	1,416	1,366	1,739	2,695
19	2,434	2,198	1,960	37,096	15,071	7,290	4,948	2,643	2,005	1,096	------	2,027
20	2,629	2,915	3,320	41,565	15,684	6,483	4,880	1,242	2,362	1,377	1,718	2,611
21	2,440	2,734	3,080	34,540	16,262	7,101	5,499	2,748	2,006	1,120	2,317	1,878
22	2,094	2,744	2,778	30,286	18,287	7,317	6,367	3,377	2,351	------	1,748	2,340
23	2,709	2,451	2,711	39,550	17,271	7,319	5,688	2,956	2,348	1,408	2,085	2,617
24	2,154	2,745	2,837	45,724	15,900	7,516	6,509	2,534	1,073	1,334	2,035	2,068
25	2,435	2,929	2,770	41,739	15,925	5,673	5,837	2,180	2,031	1,104	2,028	------
26	2,450	1,420	2,030	43,139	11,480	7,301	5,916	2,158	1,761	995	------	------
27	2,454	3,039	2,786	45,795	12,567	7,315	5,502	1,089	1,466	1,149	1,413	2,323
28	2,434	3,362	2,740	39,943	12,303	6,880	5,649	2,288	2,046	1,121	1,743	2,330
29	1,245	------	2,998	41,584	13,064	7,038	4,170	2,203	1,951	406	1,744	1,821
30	2,513	------	3,962	39,300	13,035	6,445	2,500	2,065	2,091	1,104	------	1,474
31	2,453	------	6,820	------	12,823	------	4,087	2,354	------	1,086	------	------
Mean	2,357	2,363	3,218	24,006	21,303	8,821	5,077	3,302	1,854	1,274	2,252	2,741

1900.

1	1,463	7,117	15,468	8,792	22,830	12,115	4,849	4,910	4,238	2,859	2,307	6,540
2	1,565	3,696	13,353	8,381	27,905	12,782	8,232	5,149	1,635	3,337	2,357	4,394
3	1,604	3,628	9,656	9,338	28,823	15,730	7,520	5,525	3,191	3,134	2,293	6,146
4	1,653	------	11,445	14,047	52,268	25,091	2,763	5,601	3,180	2,876	1,502	5,968
5	1,193	3,166	6,544	15,927	48,843	19,591	6,715	4,431	2,905	2,565	1,660	4,640
6	1,452	3,159	6,240	15,544	39,585	16,103	6,255	5,357	2,913	2,168	2,260	4,583
7	1,304	3,188	9,323	19,353	34,551	14,088	6,271	4,708	2,865	859	1,604	4,506
8	2,324	3,303	4,913	27,072	28,889	12,792	4,799	4,597	2,908	3,457	1,630	4,701
9	2,060	2,925	4,947	24,219	23,561	10,930	6,465	4,573	2,276	3,715	3,819	3,548
10	1,998	3,114	4,927	19,765	28,628	10,495	6,501	4,758	2,330	3,715	17,580	4,498
11	1,751	1,615	4,373	17,053	25,277	10,083	5,767	4,462	2,871	4,051	11,521	2,978
12	1,711	2,933	4,950	20,560	22,411	10,148	4,984	2,627	2,865	4,106	13,301	3,504
13	1,009	12,148	4,932	25,463	20,804	9,661	12,281	4,651	2,560	4,003	10,314	3,851
14	696	15,696	4,799	27,373	18,378	10,168	9,601	4,716	2,851	------	8,564	4,078
15	1,712	21,761	5,051	26,429	22,307	7,707	6,262	4,450	2,826	2,590	5,839	4,101
16	1,996	19,766	10,516	31,224	29,793	9,141	7,018	4,750	2,426	3,993	4,877	3,080
17	1,755	15,073	7,479	32,034	29,945	7,256	5,112	4,834	3,130	3,993	3,706	3,958
18	1,748	11,998	12,670	35,155	31,845	7,808	6,017	4,624	3,147	4,190	6,533	4,068
19	2,064	5,871	20,538	42,557	40,265	7,308	5,652	3,075	2,776	3,989	5,079	3,505
20	1,792	7,090	12,562	60,541	48,460	5,866	6,057	4,547	2,602	3,720	5,215	3,809
21	656	6,978	12,448	62,291	44,162	6,402	5,678	4,072	3,044	2,392	8,107	3,799
22	2,060	6,123	12,412	55,363	35,060	6,651	4,386	3,203	2,776	3,164	6,360	4,109
23	4,045	5,308	11,361	51,180	25,403	6,613	5,253	4,029	------	3,185	12,471	1,895
24	3,748	4,117	10,742	44,064	23,333	5,015	4,923	3,649	3,137	2,621	8,620	3,880
25	3,697	18,833	9,792	38,913	21,682	6,669	4,737	------	2,887	2,902	7,886	3,196
26	3,684	13,387	9,460	33,353	18,907	5,066	5,403	1,016	2,563	2,624	7,000	4,311
27	3,609	23,971	8,925	27,800	17,467	5,803	4,857	3,169	2,575	2,373	7,320	4,498
28	3,007	18,375	8,604	23,905	15,469	7,679	4,872	3,501	2,568	1,520	9,693	4,299
29	6,851	------	8,391	21,793	19,171	7,189	2,344	3,629	3,169	2,902	5,214	4,035
30	4,311	------	8,410	14,688	16,301	9,043	4,231	3,147	2,197	2,623	6,660	2,468
31	5,399	------	8,498	------	14,113	------	3,725	3,454	------	2,338	------	4,050
Mean	2,384	9,050	9,153	28,473	28,272	10,033	5,791	4,173	2,807	3,065	6,376	4,096

Estimated monthly discharge of Kennebec River at Waterville, Me.

[Drainage area, 4,410 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1893.						
January 12 to 31	5,000	1,900	2,650	0.60	0.69	1.62
February	3,000	2,100	2,350	0.53	0.55	2.77
March	11,300	2,300	4,180	0.95	1.09	2.49
April	19,800	3,600	11,660	2.64	2.95	2.13
May	83,500	13,600	30,520	6.92	7.98	3.42
June	23,500	11,000	15,290	3.47	3.87	0.99
July	11,230	2,240	5,770	1.31	1.51	2.27
August	2,430	1,940	2,270	0.51	0.59	2.90
September	2,680	1,710	2,040	0.46	0.52	2.12
October	4,000	1,440	2,330	0.53	0.61	4.89
November	3,980	1,980	2,230	0.51	0.56	0.86
December	2,780	1,440	1,580	0.36	0.41	2.36
The year	83,500	1,440	6,906	1.57	21.33	28.82
1894.						
January	1,910	1,470	1,640	0.37	0.43	2.43
February	1,910	1,740	1,780	0.40	0.42	1.03
March	6,660	1,740	4,020	0.91	1.05	0.86
April	35,280	4,370	14,680	3.33	3.71	0.72
May	15,650	6,100	9,570	2.17	2.50	3.78
June	12,930	3,710	7,790	1.77	1.97	2.97
July	10,020	3,345	5,720	1.30	1.50	2.56
August	3,305	2,294	2,970	0.67	0.78	3.50
September	12,102	467	2,740	0.62	0.69	3.82
October	9,036	1,655	3,750	0.85	0.98	2.41
November	10,512	1,444	3,760	0.85	0.95	2.02
December	2,600	904	1,930	0.44	0.50	1.82
The year	35,280	467	5,029	1.12	15.48	27.92

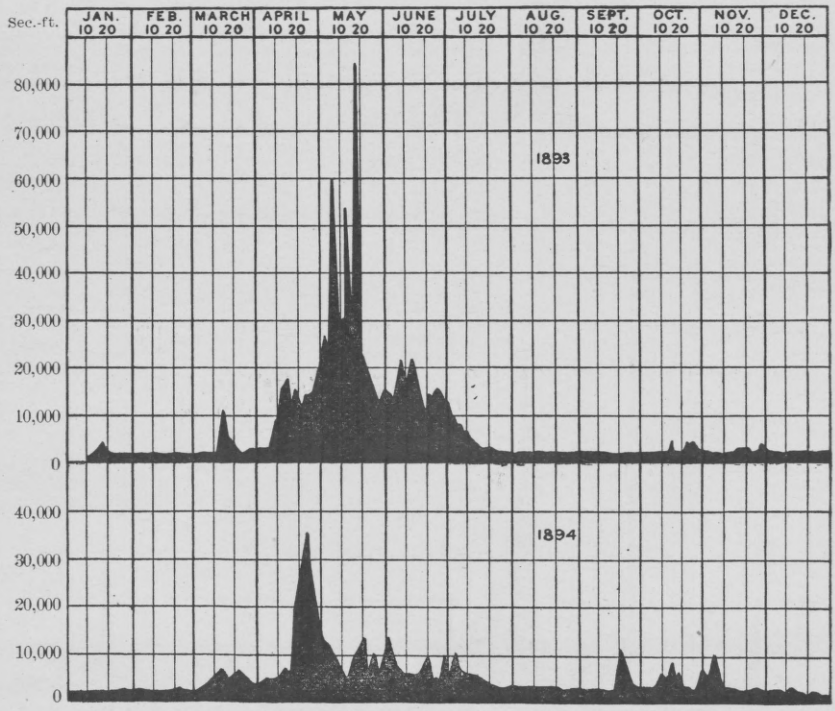


FIG. 1.—Discharge of Kennebec River at Waterville, Me., 1893 and 1894.

Estimated monthly discharge of Kennebec River at Waterville, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1895.						
January	2,509	1,135	2,040	0.46	0.53	2.23
February	2,444	579	1,800	0.41	0.43	0.34
March	2,769	1,252	2,000	0.45	0.52	1.58
April	86,201	2,176	23,930	5.43	6.05	3.50
May	16,175	4,868	9,580	2.17	2.50	1.83
June	9,818	4,497	6,430	1.46	1.63	1.96
July	5,042	2,096	3,520	0.80	0.92	3.08
August	5,089	857	2,690	0.61	0.70	2.59
September	2,867	1,104	1,780	0.40	0.45	1.11
October	1,587	1,081	1,250	0.28	0.33	1.58
November	15,900	1,081	5,610	1.27	1.42	5.47
December	26,673	1,747	6,030	1.37	1.58	3.77
The year	86,201	579	5,555	1.26	17.06	29.04

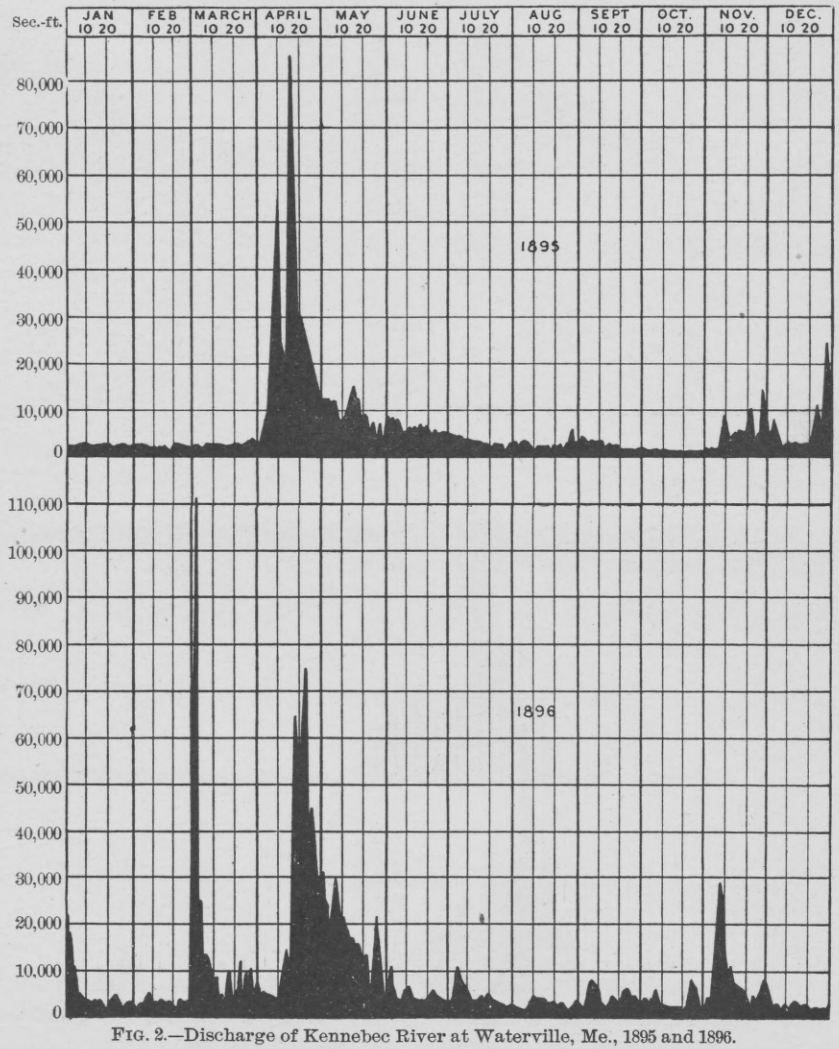


FIG. 2.—Discharge of Kennebec River at Waterville, Me., 1895 and 1896.

Estimated monthly discharge of Kennebec River at Waterville, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1896.						
January	21,881	1,568	4,304	0.98	1.13	0.31
February	4,634	1,292	2,830	0.64	0.69	2.95
March	111,246	3,239	13,140	2.98	3.44	5.62
April	74,469	4,998	27,400	6.21	6.93	1.28
May	30,879	3,192	17,050	3.87	4.46	2.33
June	11,004	3,855	5,520	1.25	1.40	1.91
July	11,678	3,335	5,330	1.21	1.39	3.21
August	4,737	1,625	3,150	0.71	0.82	3.83
September	7,978	1,733	3,410	0.77	0.86	5.10
October	8,956	2,016	3,664	0.83	0.96	2.00
November	29,865	3,435	9,059	2.07	2.31	2.35
December	8,049	1,489	2,750	0.62	0.72	1.17
The year	111,246	1,292	8,134	1.84	25.11	32.06
1897.						
January	18,504	1,650	3,587	0.82	0.94	3.31
February	6,225	2,302	3,705	0.84	0.88	1.00
March	6,345	2,007	3,970	0.86	0.99	2.63
April	66,907	6,334	25,385	5.75	6.41	2.40
May	41,284	10,818	26,942	6.11	7.05	4.47
June	18,204	7,399	12,970	2.95	3.28	3.39
July	55,634	5,218	13,115	2.98	3.44	3.52
August	13,656	4,000	7,298	1.65	1.90	2.82
September	9,689	2,801	4,595	1.08	1.20	2.54
October	6,323	967	2,635	0.60	0.69	0.53
November	13,399	1,889	5,702	1.29	1.44	3.98
December	14,005	2,541	5,331	1.21	1.39	3.06
The year	66,907	967	9,588	2.18	29.61	33.65
1898.						
January	5,434	1,738	3,213	0.73	0.84	5.07
February	4,387	2,133	3,402	0.77	0.80	6.48
March	27,432	12,997	11,287	2.56	2.95	1.45
April	52,119	6,563	29,833	6.76	7.54	2.31
May	39,372	14,611	25,120	5.70	6.57	1.55
June	14,341	4,326	9,983	2.26	2.52	3.32
July	5,464	1,745	3,908	0.89	1.02	1.13
August	4,432	913	3,133	0.71	0.82	3.71

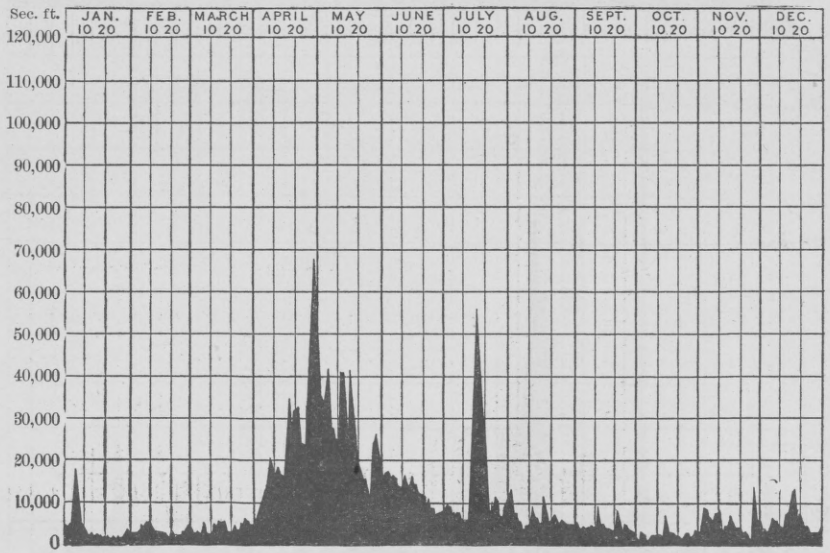


FIG. 3.—Discharge of Kennebec River at Waterville, Me., 1897.

Estimated monthly discharge of Kennebec River at Waterville, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1898.						
September	5,443	1,437	2,618	0.59	0.65	2.37
October	15,319	961	4,047	0.92	1.06	4.33
November	10,037	2,758	5,178	1.17	1.31	3.71
December	3,752	1,723	2,620	0.59	0.63	1.42
The year	52,119	913	8,695	1.97	26.76	36.85

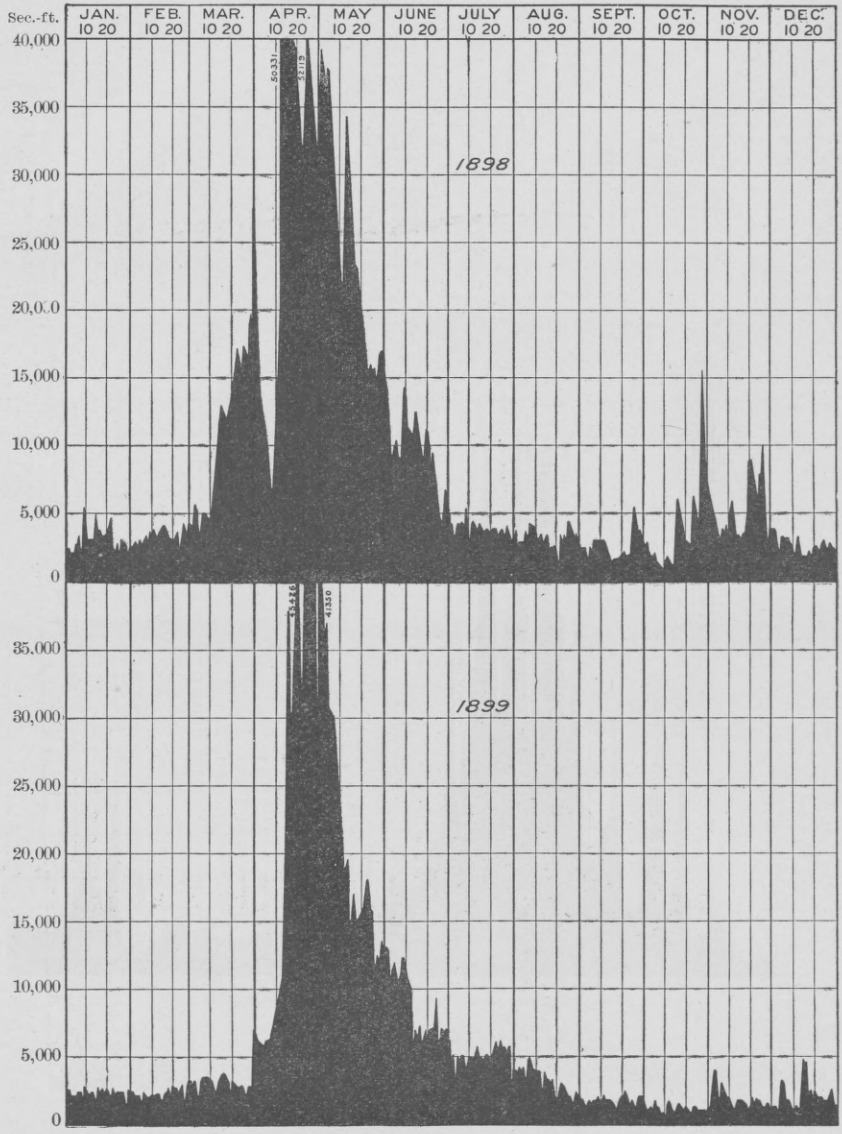


FIG. 4.—Discharge of Kennebec River at Waterville, Me., 1898 and 1899.

Estimated monthly discharge of Kennebec River at Waterville, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1899.						
January	2,757	1,245	2,357	0.53	0.61	2.76
February	3,362	1,420	2,364	0.54	0.56	2.73
March	6,820	1,960	3,218	0.73	0.84	3.66
April	45,422	5,945	23,429	5.31	5.93	1.05
May	41,348	11,380	21,228	4.81	5.54	2.05
June	13,292	5,593	8,807	2.00	2.23	1.39
July	6,386	2,400	5,036	1.14	1.31	5.13
August	4,968	1,620	3,217	0.73	0.84	0.46
September	2,565	1,200	1,906	0.43	0.48	3.58
October	1,823	561	1,224	0.28	0.32	1.11
November	4,025	1,100	2,021	0.46	0.52	2.32
December	4,898	900	2,254	0.51	0.59	1.93
The year	45,422	561	6,422	1.46	19.77	28.17
1900.						
January	6,851	656	2,384	0.54	0.62	5.89
February	23,971	1,615	9,050	2.05	2.14	7.00
March	20,538	4,373	9,153	2.08	2.40	4.75
April	62,291	8,381	28,473	6.46	7.21	1.63
May	52,268	14,113	28,272	6.41	7.39	5.18
June	25,091	5,015	10,033	2.27	2.53	4.08
July	12,281	2,344	5,791	1.31	1.51	3.40
August	5,601	1,016	4,173	0.95	1.09	1.76
September	4,238	1,635	2,807	0.64	0.71	2.55
October	4,190	859	3,065	0.70	0.81	4.05
November	17,580	1,502	6,376	1.45	1.62	4.55
December	6,540	1,895	4,096	0.93	1.07	2.19
The year	62,291	656	9,473	2.15	29.10	47.03

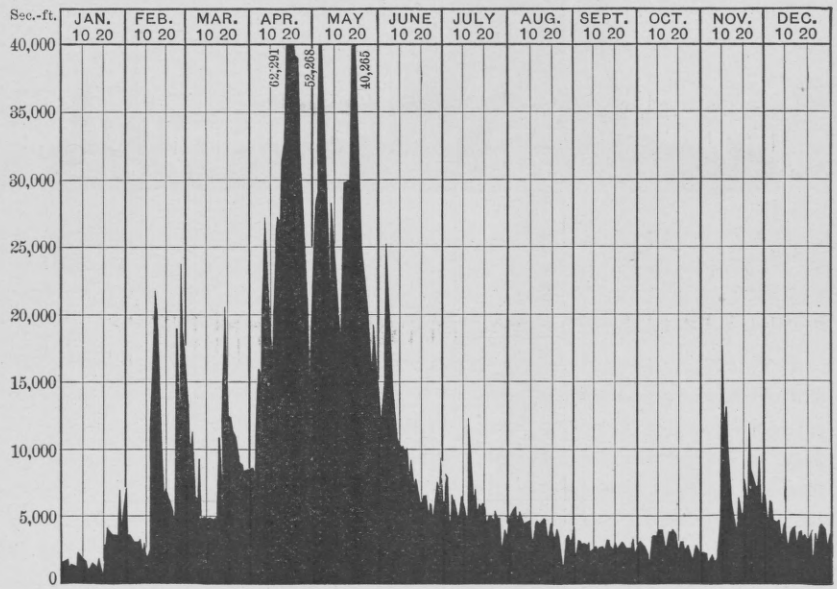


FIG. 5.—Discharge of Kennebec River at Waterville, Me., 1900.

The following table gives the monthly and yearly run-off of the Kennebec Basin for the years 1893 to 1900, inclusive:

Run-off, in second-feet per square mile, of Kennebec River at Waterville, Me.

[Drainage area, 4,410 square miles.]

	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Average.
January	0.60	0.37	0.46	0.98	0.82	0.73	0.53	0.54	0.63
February	0.53	0.40	0.41	0.64	0.84	0.77	0.54	2.05	0.77
March	0.95	0.91	0.45	2.98	0.86	2.56	0.73	2.08	1.44
April	2.64	3.33	5.43	6.21	5.75	6.76	5.31	6.46	5.24
May	6.92	2.17	2.17	3.87	6.11	5.70	4.81	6.41	4.77
June	3.47	1.77	1.46	1.25	2.95	2.26	2.00	2.27	2.18
July	1.31	1.30	0.80	1.21	2.98	0.89	1.14	1.31	1.37
August	0.51	0.67	0.61	0.71	1.65	0.71	0.73	0.95	0.82
September	0.46	0.62	0.40	0.77	1.08	0.59	0.43	0.64	0.62
October	0.53	0.85	0.28	0.83	0.60	0.92	0.28	0.70	0.62
November	0.51	0.85	1.27	2.07	1.29	1.17	0.46	1.45	1.13
December	0.36	0.44	1.37	0.62	1.21	0.59	0.51	0.93	0.75
The year	1.57	1.12	1.26	1.84	2.18	1.97	1.46	2.15	1.70

In the following table is given a comparison between the precipitation at Fairfield, Me., and the run-off of the Kennebec Basin. Fairfield is near the southern end of the basin, and it is likely that the rainfall may increase somewhat in the northern and more elevated portions of the area. The Geological Survey has recently established gages in the northern part of the basin, but the records are not of sufficient length for use in these comparisons.

Ratio of run-off to rainfall in basin of Kennebec River.

	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Average.
Precipitation, inches	28.82	27.92	29.04	32.06	33.65	36.85	28.17	47.03	32.94
Run-off, inches	21.33	15.48	17.06	25.11	29.61	26.76	19.77	29.10	23.03
Ratio	0.74	0.55	0.59	0.78	0.88	0.73	0.70	0.62	0.70

TRIBUTARIES OF MOOSEHEAD LAKE AND KENNEBEC RIVER.

ROACH RIVER.

Roach River receives its headwaters from the slopes of Boardman and White Cap Mountain, flows through a series of ponds, and finally enters Spencer Bay, an arm of Moosehead Lake. This stream and Moose River are the upper feeders of Moosehead Lake. In 1901 a gaging station was established by the Geological Survey at the foot of Roach Pond, where records of river height will be read daily by a local observer and meter measurements made often enough to construct a rating curve.

MOOSE RIVER.

Moose River, the largest feeder of Moosehead Lake, with a drainage area of 660 square miles, has a number of large lakes in its basin,

which in most parts of the country would be considered excellent storage reservoirs, but when compared with Moosehead Lake are of small capacity. It is possible, however, that when the flow of the Kennebec is more carefully regulated it will be considered advisable to utilize these lakes as secondary storage basins. At present there are several dams on the river, for the purpose of holding back water for driving logs.

TOMHEGAN AND SOCATEAN RIVERS.

These are two small streams feeding Moosehead Lake. They have a number of small lakes in their watersheds and considerable fall throughout their courses.

DEAD RIVER.

South of Moosehead Lake the Kennebec receives a number of small tributaries, by far the most important being the west outlet of that lake. About 23 miles south of the lake Dead River adds its waters to the Kennebec. The drainage basin of this stream has an area of 1,000 square miles, for the most part a wild forested area. The river has at intervals falls of considerable heights, which would be valuable for water power if transportation were available. The storage capacity on this stream is limited. Hurricane Falls, Long Falls, and Grand Falls could, however, be economically utilized.

During the summer of 1901 the United States Geological Survey established a gaging station on the river, at The Forks.

SANDY RIVER.

Sandy River, a large tributary from the west, rises in a hilly country near the Rangeley Lakes, and has an aggregate fall of about 1,600 feet. Unlike most of the rivers of this region it has no tributary lake of large size, and therefore lacks that regulating influence. The drainage area is about 650 square miles, but the flow is small and the fluctuations are quite marked. The Sandy River Railroad follows the river throughout most of its course, furnishing good transportation, but only small developments of water power have been made, viz, at New Sharon and Farmington.

CARRABASSETT RIVER.

This river enters the Kennebec from the west, at North Anson. It has considerable fall, which has been used to some extent for power development. There are sites for further development, perhaps the best being in the town of North Anson. In Pl. IX, *A* is shown an undeveloped fall near the mouth of the stream. Gagings of the river are now regularly made by the United States Geological Survey.

A. FALLS ON CARRABASSETT RIVER, NORTH ANSON.

B. FALLS ON MESSALONSKEE RIVER AT OAKLAND.

SEBASTICOOK RIVER.

Sebasticook River, with a drainage area of 1,060 square miles, enters the Kennebec from the east, opposite Waterville. In the 45 miles from Moose Pond to the mouth there is a fall of 170 feet. The stream is followed closely by railroads and possesses a number of good water powers, perhaps the most important being that of the Kennebec Fiber Company, about 5 miles from the mouth, which utilizes 1,400 horsepower under an average head of 26 feet.

MESSALONSKEE RIVER.

Messalonskee River drains 205 square miles and discharges into the Kennebec from the west, at Waterville. It is fed from extensive lakes, the aggregate surface area of which is between 25 and 30 square miles. These render its flow very constant and give it considerable value for power. The fall is stated to be 164 feet in the 5 or 6 miles from the lowest lake to the mouth. Near the mouth the Union Gas and Electric Company develops 800 horsepower over a 35-foot dam, the power being transformed into electricity for both power and lighting. Above this point power is utilized to the extent of 250 horsepower for the Waterville pumping station and for several molding and planing mills. Farther upstream, in Oakland, there are several excellent powers, with falls of 14, 40, 15, and 12 feet, which are partially utilized. One of these power sites is shown is Pl. IX, *B*.

COBBOSSEECONTEE RIVER.

Cobbosseecontee River drains a group of lakes lying from 5 to 15 miles westerly from Augusta, and empties into the Kennebec 6 miles below that city at Gardiner, its drainage area amounting to about 230 square miles. From the ordinary surface of Lake Maranacook, one of the upper lakes, to mean tide at the mouth of the river the fall is 206 feet, and in the lower three-fourths of a mile it is said to be 136 feet. From above the uppermost of the 8 dams controlled by the Gardiner Water Power Company, which are in the latter three-fourths of a mile, the municipal water supply for Gardiner is drawn and pumped by water power. Record is kept of the water pumped and of the water that passes the dam through a waste gate. The sum of these quantities represents the yield of the drainage area at the upper dam, records of which have been kept by the Gardiner Water Power Company for a series of years, and have been furnished to the Survey by their engineer, Mr. A. H. Twombly. These records are presented in the accompanying tables. On Sundays and on legal holidays the gates are closed and no water is permitted to run unless the lakes are full. This is a most remarkable example of the regularity of flow that can be obtained with proper storage.

Daily discharge, in second-feet, of Cobbosseecontee River at the upper dam near Augusta, Me.

[Drainage area, 230 square miles.]

1890.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		300	290	290	290	393	300
2		300	290	290	290	379	300
3		300		290	290	379	300
4			290	290	290	379	300
5		306	290	290		368	300
6		326	290	290	290	357	300
7		356	290		290	347	
8		374	290	290	300	347	300
9		374	290	290	300	333	300
10		340		290	300	333	300
11		314	290	290	300	326	300
12		306	290	290		300	300
13		156	290	290	300	300	300
14		300	290		300	300	
15		300	290	290	300	300	300
16	340	300	290	290	300		300
17	356	300		290	300	300	300
18	356		290	290	300	379	300
19	356		290	290		445	300
20	340	290	290	290	300	431	300
21	326	290	290	290	300	418	
22		290	290	290	300	405	300
23	300	290	290	290	300	393	300
24	300	290	34	290	337	379	300
25	306	290	290	290	337	368	
26	314	290	290	290	337	357	290
27	314		280	290	345	347	290
28	306	290	290		345	337	
29		290	290	290	345	337	290
30	300	290	290	290	379	300	290
31		290			393		290
Mean	324	302	290	290	313	356	298

1891.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	290	850	839	2,169	300	300	300	290	285	260	(a)	(a)
2	290	780	774	2,114	300	300	300		285	260	(a)	(a)
3	290	713	713	2,059		300	300	285	280	260	(a)	(a)
4		713	653	2,059	300	300		285	280		(a)	(a)
5	290	682	594	2,059	300	300		285	280	260	(a)	(a)
6	290	620	567	1,940	300	300	300	285		250	(a)	220
7	290	590	540	1,836	300		300	290	280	250	(a)	220
8	290		540	1,782	300	300	300	290	280	250	(a)	220
9	290	373	515	1,598	300	300	300		280	250	(a)	220
10	290	435	540	1,567		300	300	285	280	250	(a)	(a)
11		458	743	1,495	300	300	300	285	280		(a)	(a)
12	300	458	807	1,514	300	300		285	270	250	(a)	(a)
13	300	458	807	1,514	300	300	290	285		250	(a)	(b)
14	300	548	1,801	1,365	300		290	285	270	250	(a)	(a)
15	300	529	1,753	1,223	300	300	290	285	270	250	(a)	(a)
16	300	590	1,573	1,270	300	300	290		270	250	(a)	(a)
17	300	602	1,364	1,318		300	290	285	270	250	(a)	(a)
18	300	574	1,286	1,318	300	300	290	285	270		(a)	(a)
19	300	516	1,241	1,318	300	300		285	270	220	(a)	(a)
20	300	516	1,204	1,318	306	300	290	285		220	(a)	(b)
21	300	483	1,167	1,273	314		290	285	270	220	(a)	(a)
22	300	483	1,531	1,050	316	300	290	285	270	220	(a)	(a)
23	503	363	2,199	1,013	300	300	290		270	220	(a)	(a)
24	1,120	363	2,365	300		300	290	285	260	220	(a)	220
25	1,100	393	2,365	300	300	300	290	285	260		(a)	(b)
26	1,063	620	2,585	314	300	300		285	260	220	(a)	(b)
27	1,063	942	2,531	306	300	300	290	285		(a)	(a)	(b)
28	1,063	907	2,344	306	300		290	285	260	(a)	(a)	220
29	1,063		2,344	300	300	300	290	285	260	(a)	(a)	220
30	1,079		2,344	300	300	300	290		260	(a)	(a)	220
31	1,001		2,295				290	285		(a)		220
Mean	516	576	1,385	1,277	301	300	293	286	272	242		

(a) Water so low only gage record kept.
(b) Water shut back Sundays and holidays.

Daily discharge, in second-feet, of Cobbosseecontee River, etc.—Continued.

1892.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	220	270	280	280	------	280	280	280	280	280	280	280
2	220	270	280	280	280	280	280	280	280	------	280	280
3	------	270	280	------	280	280	------	280	280	280	280	280
4	220	280	280	280	280	280	------	280	------	280	280	------
5	250	280	280	280	280	------	280	280	280	280	280	280
6	250	280	------	294	280	280	280	280	280	280	------	280
7	250	------	280	294	280	280	280	------	280	280	280	280
8	250	280	280	294	------	280	280	280	280	280	280	280
9	250	280	280	286	280	280	280	280	280	------	280	280
10	------	280	280	------	280	280	280	280	280	280	280	280
11	250	280	280	306	280	280	(a)	280	------	280	280	------
12	250	280	280	294	280	------	(a)	280	280	280	280	280
13	250	280	------	280	280	280	(a)	280	280	280	------	280
14	250	------	280	280	280	280	(a)	------	280	280	280	280
15	270	280	280	280	------	280	(a)	280	280	280	280	280
16	270	280	280	280	280	280	(a)	280	280	------	280	280
17	------	280	280	------	280	280	(a)	280	280	280	280	280
18	270	280	280	280	280	------	280	280	------	280	280	------
19	270	280	280	280	280	------	280	280	280	280	280	280
20	276	280	------	280	280	280	280	280	280	280	------	280
21	276	------	280	280	280	280	280	------	280	280	280	280
22	270	280	280	280	280	280	280	280	280	280	280	280
23	270	280	280	280	280	280	280	280	280	------	280	280
24	------	280	280	------	280	280	------	280	280	280	------	280
25	270	280	280	280	280	280	280	280	------	280	280	------
26	270	280	280	280	280	------	280	280	280	280	280	280
27	270	280	------	280	280	280	280	280	280	280	------	280
28	270	------	280	280	280	280	280	------	280	280	280	280
29	270	280	280	280	280	280	280	280	280	280	280	280
30	270	------	280	280	280	280	280	280	280	------	280	280
31	------	------	280	------	280	------	------	280	------	280	------	280
Mean	258	279	280	283	280	280	280	280	280	280	280	280

(a) Water shut back.

1893.

1	------	280	280	535	435	300	280	280	(a)	------	250	220
2	280	280	280	314	458	300	------	280	(a)	250	250	220
3	280	280	280	300	509	300	280	280	(a)	250	250	------
4	280	280	280	300	596	------	------	280	270	250	250	220
5	280	280	------	300	1,079	300	280	280	(a)	220	------	220
6	280	280	280	300	1,295	300	280	------	(a)	(a)	220	220
7	280	280	280	300	1,179	300	280	280	(a)	(a)	220	220
8	------	280	280	300	985	300	280	270	(a)	(a)	220	220
9	280	280	280	------	713	300	------	270	270	220	220	220
10	280	280	280	300	620	300	280	270	------	220	220	------
11	280	280	280	314	590	------	280	270	270	220	220	220
12	280	------	------	481	562	280	280	270	270	220	------	220
13	280	280	280	682	562	280	280	------	270	(a)	220	220
14	280	280	509	650	887	280	280	270	270	(a)	220	220
15	------	280	620	650	1,262	280	280	270	(a)	(a)	220	220
16	280	280	620	1,040	1,354	280	------	270	(a)	220	220	220
17	280	280	535	1,079	1,552	280	280	270	(a)	220	220	------
18	280	280	509	1,001	2,680	------	280	270	270	220	220	220
19	280	------	458	962	2,481	280	280	270	270	(a)	------	220
20	280	280	435	925	2,002	280	280	------	270	(a)	220	220
21	280	280	393	887	1,900	280	280	270	270	(a)	220	220
22	------	280	393	962	1,752	280	280	270	(a)	(a)	220	220
23	280	280	356	962	1,660	280	------	270	(a)	(a)	220	220
24	280	280	356	925	1,428	280	280	270	(a)	(a)	220	------
25	280	280	356	780	1,052	------	280	270	250	250	220	------
26	280	------	458	713	562	280	280	270	250	250	------	220
27	280	280	590	620	326	280	280	------	250	250	220	220
28	280	280	620	650	326	280	280	270	250	250	220	220
29	------	------	562	620	326	280	280	270	250	------	220	220
30	280	------	780	393	326	280	------	270	250	250	------	220
31	280	------	620	------	307	------	280	270	------	250	------	------
Mean	280	280	422	629	1,025	287	280	272	263	236	225	220

(a) Water shut back.

Daily discharge, in second-feet, of Cobbosseecontee River, etc.—Continued.

1894.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	220	220	220	.....	300	925	.....	280	280	270	250	250
2	220	220	220	314	300	889	280	280	.....	250	250	.....
3	220	220	220	314	300	674	280	280	.....	250	250	250
4	220	.....	.....	306	280	326	.....	280	280	250	.....	250
5	220	220	220	306	280	326	280	.....	280	250	250	250
6	220	220	220	306	.....	326	280	280	280	250	250	250
7	.....	220	220	306	280	326	280	280	270	.....	250	250
8	220	220	220	26	280	326	.....	280	270	250	250	250
9	220	220	220	326	280	326	280	280	.....	250	250	.....
10	220	220	220	314	280	200	280	280	270	250	250	250
11	220	.....	.....	314	280	326	280	280	270	250	.....	250
12	220	220	276	314	280	314	280	.....	270	250	250	250
13	220	220	483	314	.....	300	280	280	270	250	250	250
14	.....	220	483	314	280	300	280	280	270	.....	250	250
15	220	220	426	.....	280	280	.....	280	270	250	250	250
16	220	220	426	430	280	280	280	280	.....	250	250	.....
17	220	220	410	430	280	.....	280	280	270	250	250	250
18	220	.....	405	430	280	280	280	280	270	250	.....	250
19	220	220	405	314	280	280	280	.....	270	250	250	250
20	220	220	630	314	.....	280	280	280	270	250	250	250
21	.....	220	900	314	280	280	280	280	270	.....	250	250
22	220	220	887	26	280	280	.....	280	270	250	250	250
23	220	220	692	326	280	280	280	280	.....	250	250	.....
24	220	220	306	314	280	.....	280	280	270	250	250	250
25	220	.....	14	314	280	280	280	280	270	250	.....	.....
26	220	220	314	306	336	280	280	.....	270	250	250	250
27	220	220	314	300	523	280	280	280	270	250	250	250
28	.....	220	314	300	499	280	280	280	270	.....	250	250
29	220	.....	300	.....	370	280	.....	280	270	250	.....	250
30	220	.....	300	300	523	280	280	280	.....	250	250	.....
31	220	.....	300	.....	862	.....	280	280	.....	250	.....	250
Mean	220	220	364	303	333	350	280	280	272	251	250	250

1895.

1	250	250	.....	250	385	280	280	280	.....	220	(a)	.....
2	250	250	.....	250	318	.....	280	280	270	220	(a)	220
3	250	.....	.....	250	300	280	280	280	270	220	.....	220
4	250	220	220	250	290	280	.....	.....	270	(a)	(a)	220
5	250	220	220	250	.....	280	280	280	270	(a)	(a)	220
6	.....	220	220	250	280	280	280	280	270	.....	(a)	220
7	250	220	220	14	280	280	.....	280	270	220	(a)	220
8	250	220	.....	343	280	280	280	280	.....	(a)	(a)	.....
9	250	220	220	733	280	.....	280	280	270	(a)	(a)	220
10	250	.....	.....	2,619	280	280	280	280	250	(a)	.....	220
11	250	220	220	1,301	280	280	280	.....	250	(a)	(a)	220
12	250	220	220	1,384	.....	280	280	270	250	(a)	(a)	220
13	.....	220	220	300	280	280	280	270	250	.....	(a)	220
14	250	220	220	74	280	280	.....	270	250	(a)	(a)	220
15	250	220	220	2,603	280	280	280	270	.....	(a)	(a)	.....
16	250	220	220	2,461	280	.....	280	270	250	(a)	(a)	220
17	250	.....	.....	1,698	280	280	280	270	250	(a)	.....	220
18	250	220	220	1,609	280	280	280	.....	250	(a)	220	220
19	250	220	220	1,400	.....	280	280	270	250	(a)	220	220
20	.....	220	220	1,271	280	280	280	270	(a)	.....	220	220
21	250	220	220	480	.....	280	.....	270	(a)	(a)	220	220
22	250	220	220	664	280	280	280	270	.....	(a)	220	.....
23	250	220	220	358	280	.....	280	270	220	(a)	220	220
24	250	.....	.....	385	280	280	280	270	220	(a)	.....	220
25	250	220	220	385	280	280	280	.....	220	(a)	220	.....
26	250	220	220	385	.....	280	280	270	220	(a)	220	250
27	.....	220	220	385	280	280	280	270	220	.....	220	250
28	250	.....	220	409	280	280	.....	270	220	(a)	.....	250
29	250	.....	220	409	280	280	280	270	.....	(a)	220	14
30	250	.....	220	409	280	.....	280	270	220	(a)	220	264
31	250	.....	.....	.....	280	.....	280	270	.....	(a)	.....	343
Mean	250	223	220	785	287	280	280	273	247	220	220	222

(a) Gates up; natural flow.

Daily discharge, in second-feet, of Cobbosseecontee River, etc.—Continued.

1896.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	270	------	901	300	280	280	280	250	250	------	250
2	451	------	1,959	993	300	280	280	------	250	250	220	250
3	276	270	2,698	901	------	280	280	280	250	250	220	250
4	264	270	1,959	856	300	280	------	280	250	------	220	250
5	------	270	1,637	856	300	280	------	270	250	250	220	250
6	270	270	1,219	856	300	280	280	270	------	250	220	------
7	270	270	1,219	856	280	------	280	270	250	250	220	250
8	270	270	1,226	856	280	280	280	270	250	250	------	250
9	270	------	1,368	769	280	280	280	------	250	250	220	250
10	270	270	1,368	727	------	280	280	270	250	250	220	250
11	270	270	946	727	280	280	280	270	250	------	220	250
12	------	270	1,038	727	280	280	------	270	250	250	220	250
13	270	270	1,086	727	280	280	280	270	------	250	220	------
14	270	270	1,038	812	280	------	280	270	250	220	220	250
15	270	270	901	812	280	280	280	270	270	220	------	250
16	270	------	769	901	280	280	280	------	270	220	220	250
17	270	270	727	946	------	280	280	270	270	220	220	250
18	270	270	685	1,188	280	280	280	270	250	------	250	250
19	------	270	856	1,236	280	280	------	270	250	220	250	250
20	270	270	993	1,039	280	280	280	270	------	220	250	------
21	270	270	1,581	901	280	------	280	270	250	220	250	250
22	270	270	1,429	992	280	280	280	270	250	220	------	250
23	270	------	1,275	1,039	280	280	280	------	250	220	250	250
24	270	280	1,056	901	------	280	280	270	250	220	250	250
25	270	280	728	769	280	280	280	270	250	------	250	------
26	------	280	686	644	280	280	------	270	250	220	------	250
27	270	280	812	526	280	280	280	270	------	220	250	------
28	270	280	769	300	280	------	280	270	250	220	250	250
29	270	280	727	300	280	280	280	270	250	220	------	250
30	270	------	644	300	------	280	280	------	250	220	250	250
31	270	------	727	------	------	------	280	250	------	220	------	250
Mean	277	272	1,138	812	284	280	280	270	252	232	233	250

1897.

1	250	250	250	497	280	600	280	------	280	280	270	270
2	250	250	250	517	------	477	280	280	280	280	270	270
3	------	250	250	574	368	573	280	280	280	------	270	270
4	250	250	250	350	624	523	------	280	280	280	270	270
5	250	250	250	620	630	477	100	280	------	280	270	------
6	250	250	250	650	320	262	280	280	280	280	270	270
7	250	------	------	650	320	336	280	280	280	280	------	270
8	250	250	250	650	320	336	280	------	280	280	270	270
9	250	250	250	620	74	320	280	280	280	280	270	270
10	------	250	250	620	373	320	280	280	280	------	270	270
11	250	250	250	650	393	512	------	280	280	280	270	270
12	250	250	250	590	393	559	280	280	------	280	270	------
13	250	250	250	421	393	679	280	280	280	280	270	270
14	250	------	------	310	------	679	280	280	280	270	------	270
15	250	250	250	356	489	436	280	------	280	(a)	270	270
16	250	250	250	522	244	354	280	280	280	(a)	270	270
17	------	250	250	497	509	320	280	280	280	(a)	270	270
18	250	250	250	497	833	294	------	280	280	(a)	270	280
19	250	550	250	473	769	286	280	280	------	(a)	270	------
20	250	250	250	453	739	6	280	280	280	(a)	270	280
21	250	------	------	320	709	286	280	280	280	(a)	------	280
22	250	250	250	294	391	436	280	------	280	(a)	270	280
23	250	250	250	286	6	654	280	280	280	(a)	270	280
24	------	250	250	280	280	365	280	280	280	------	270	280
25	250	250	250	14	280	294	------	280	280	270	270	21
26	250	250	250	286	280	286	280	280	------	270	270	------
27	250	250	250	280	280	------	280	280	280	270	270	280
28	250	------	------	286	320	280	280	280	280	270	------	280
29	250	------	250	286	15	280	280	------	280	270	270	280
30	250	------	250	280	914	280	280	280	280	270	270	280
31	------	------	306	------	772	------	280	280	------	------	------	280
Mean	250	250	252	438	425	397	273	280	280	276	270	265

(a) Gates up; natural flow.

Daily discharge, in second-feet, of Cobbosseecontee River, etc.—Continued.

1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	280	280	413	------	478	280	280	280	270	250	250	250
2	------	280	394	------	478	280	280	280	270	------	250	250
3	280	280	443	1,016	478	280	------	280	270	250	250	250
4	280	280	408	1,038	455	280	19	280	------	250	250	------
5	280	280	408	1,038	455	------	280	280	250	250	250	270
6	280	------	387	1,038	433	280	280	280	250	250	------	270
7	280	280	466	1,038	433	280	280	------	250	250	250	270
8	280	280	529	1,038	273	280	280	280	250	250	250	270
9	------	280	503	1,038	333	280	280	280	250	------	250	270
10	280	280	474	1,003	333	280	------	280	250	250	250	270
11	280	280	456	584	314	280	280	280	------	250	250	------
12	280	280	559	531	300	------	280	280	250	250	250	270
13	280	------	597	326	300	280	280	280	250	250	------	270
14	280	280	821	326	300	280	280	------	250	250	250	270
15	280	280	1,148	334	------	280	280	280	250	250	250	270
16	------	300	1,111	376	300	280	280	270	250	------	250	270
17	280	300	1,039	413	300	280	------	270	250	220	250	270
18	280	300	969	433	300	280	280	270	------	220	250	------
19	280	300	969	433	300	------	280	270	250	220	250	270
20	280	300	1,016	433	300	280	280	270	250	220	------	270
21	280	328	1,222	433	300	280	280	------	250	220	250	270
22	280	328	1,184	433	------	280	280	270	250	220	250	270
23	------	333	1,147	433	300	280	280	270	250	------	250	270
24	280	445	1,222	433	300	280	------	270	250	220	------	270
25	280	504	1,261	555	280	280	280	270	------	220	250	------
26	280	477	1,222	732	280	------	280	270	250	220	250	270
27	280	435	1,125	682	280	280	280	270	250	220	------	270
28	280	433	1,147	478	280	280	280	------	250	250	250	270
29	280	------	1,184	478	------	280	280	270	250	250	250	270
30	------	------	1,147	620	280	280	280	270	250	------	250	270
31	280	------	1,147	------	280	------	------	270	------	250	------	270
Mean	280	324	843	633	337	280	270	275	252	238	250	268

1899.

1	------	270	270	300	300	280	280	280	270	(a)	160	160
2	270	270	270	306	300	280	------	280	270	(a)	180	160
3	270	270	270	306	300	280	280	280	------	(a)	180	------
4	270	270	270	306	300	------	19	280	270	(a)	170	180
5	270	------	------	359	300	280	280	280	250	(a)	------	180
6	270	270	270	373	300	280	280	------	250	(a)	180	180
7	270	270	250	395	------	280	280	280	250	(a)	175	170
8	------	270	270	502	300	280	280	280	250	(a)	170	150
9	270	270	270	842	300	280	------	280	(a)	(a)	170	135
10	270	270	270	1,198	300	280	280	280	------	(a)	150	------
11	270	270	270	1,262	300	------	280	280	250	(a)	150	120
12	270	------	------	984	300	280	280	280	250	(a)	------	120
13	270	270	270	772	300	280	280	------	250	(a)	150	120
14	270	270	270	809	------	280	280	280	(a)	(a)	150	120
15	------	270	270	809	290	280	280	280	(a)	(a)	140	120
16	270	270	270	787	290	280	------	270	(a)	(a)	130	140
17	270	270	270	947	290	280	280	270	------	(a)	130	------
18	270	270	270	1,243	290	------	280	270	250	(a)	130	140
19	270	------	------	1,387	290	280	280	270	(a)	(a)	------	135
20	270	270	270	1,427	290	280	280	------	(a)	(a)	160	135
21	270	270	270	1,403	------	280	280	270	(a)	(a)	170	135
22	------	270	270	1,331	280	280	280	270	(a)	(a)	180	135
23	270	270	270	1,145	20	280	------	270	(a)	(a)	180	135
24	270	270	270	1,130	280	280	280	270	------	(a)	180	------
25	270	270	270	870	280	------	280	270	220	(a)	180	------
26	270	------	------	669	280	280	280	270	(a)	(a)	------	150
27	270	270	270	635	280	280	280	------	(a)	(a)	170	150
28	270	270	270	470	------	280	280	270	(a)	(a)	165	140
29	------	------	280	324	280	280	280	270	(a)	(a)	150	140
30	270	------	280	------	280	280	------	270	(a)	(a)	------	140
31	270	------	280	------	280	------	280	270	------	------	------	------
Mean	270	270	270	803	281	280	270	275	252	------	162	144

a Gates up; natural flow.

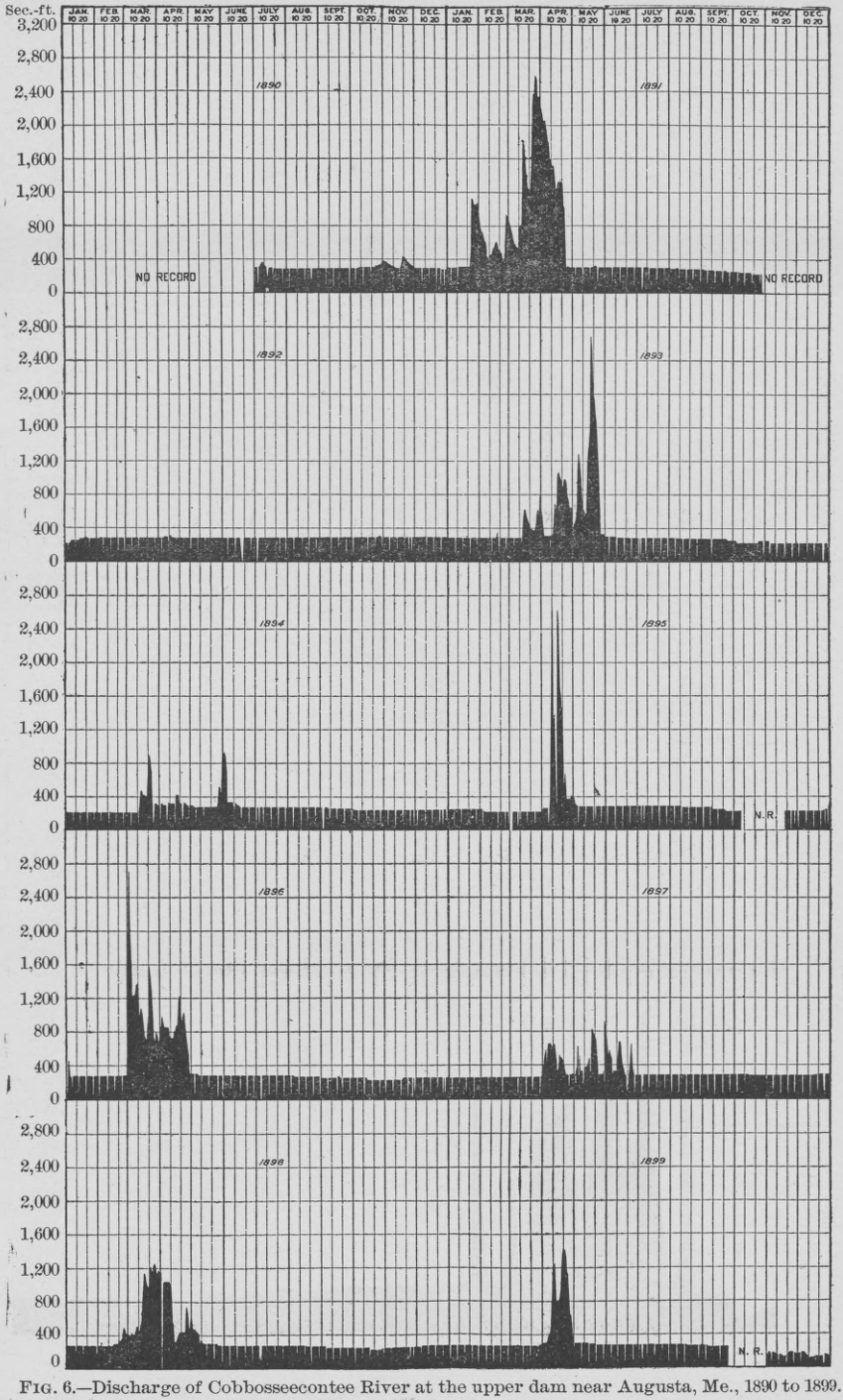


FIG. 6.—Discharge of Cobbosseecontee River at the upper dam near Augusta, Me., 1890 to 1899.

Daily discharge, in second-feet, of Cobbosseecontee River, etc.—Continued.

1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	130	220	815	776	300	300	(a)	260	260	230	180	220
2	130	220	1,463	495	300	300	280	260	(a)	220	165	(a)
3	130	220	2,316	417	300	(a)	280	260	260	190	140	220
4	125	(a)	2,055	656	413	300	(a)	260	260	175	(a)	220
5	125	220	1,911	977	803	280	280	(a)	240	175	130	220
6	125	220	1,622	907	934	280	280	260	240	150	130	220
7	(a)	220	1,481	1,087	831	280	280	260	240	(a)	130	220
8	130	220	1,295	1,379	606	280	(a)	260	240	160	130	220
9	110	220	1,155	1,380	456	280	280	260	(a)	175	200	(a)
10	100	220	1,155	1,342	413	(a)	280	260	240	180	220	220
11	90	(a)	1,153	1,297	348	280	280	260	240	190	(a)	220
12	90	220	1,116	1,297	300	280	280	(a)	240	220	220	240
13	90	220	1,037	1,297	(a)	280	280	260	235	220	220	240
14	(a)	2,194	999	1,297	300	280	280	260	230	(a)	220	230
15	100	1,573	999	1,297	300	280	(a)	260	230	220	220	230
16	95	1,283	999	1,213	300	280	280	260	(a)	220	220	(a)
17	90	856	1,615	1,105	300	(a)	280	260	250	220	220	240
18	90	562	1,611	1,072	300	280	280	260	250	220	(a)	240
19	90	425	1,473	1,260	300	280	280	(a)	250	220	220	240
20	90	294	1,518	1,380	585	280	280	260	250	220	220	240
21	(a)	270	1,811	1,338	704	280	280	275	245	(a)	220	240
22	140	270	1,662	1,260	998	280	(a)	275	250	220	220	240
23	160	270	1,517	1,223	1,325	280	280	275	(a)	220	220	(a)
24	200	270	1,472	1,223	1,422	(a)	280	275	250	220	220	240
25	200	(a)	1,334	1,182	1,301	280	270	275	250	220	(a)	(a)
26	200	564	1,289	869	1,016	280	260	(a)	250	220	220	240
27	200	662	1,206	570	456	280	260	275	250	220	220	240
28	(a)	776	1,206	377	357	280	260	275	245	(a)	220	240
29	220	------	1,105	(a)	300	280	(a)	275	230	220	220	240
30	220	------	1,015	300	300	280	260	260	(a)	220	220	(a)
31	220	------	925	------	300	------	260	260	------	200	------	240
Mean	136	508	1,365	1,044	562	282	276	264	245	206	199	232

a Water shut back on Sunday when under control.

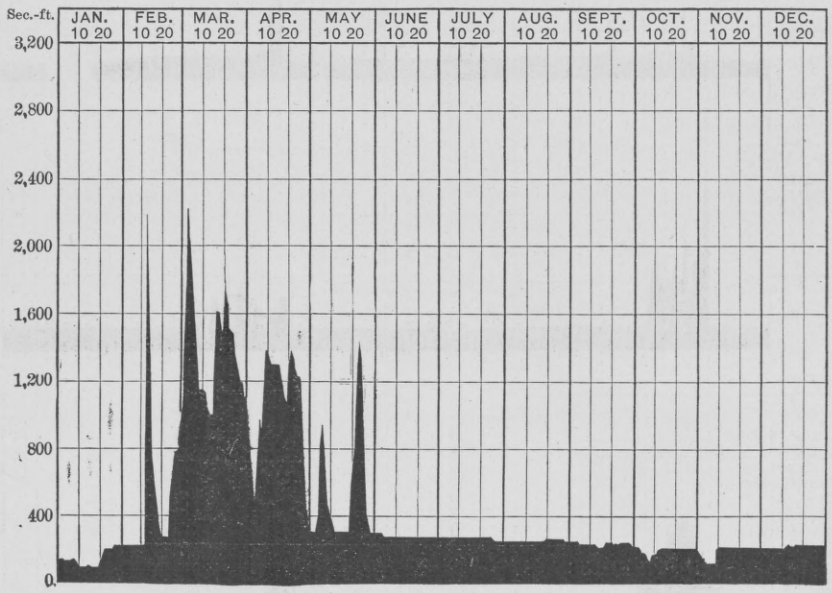


Fig. 7.—Discharge of Cobbosseecontee River at upper dam near Augusta, Me., 1900.

Daily discharge, in second-feet, of Cobbosseecontee River, etc.—Continued.

1901.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	240	220	120	535	260	510	280	280	(a)	270	250	(a)
2	240	220	120	439	260	483	280	280	280	270	250	220
3	250	(a)	(a)	646	260	439	280	280	280	250	(a)	220
4	250	220	120	1,439	260	303	(a)	(a)	280	250	250	220
5	250	220	120	2,118	(a)	303	280	280	280	250	250	220
6	(a)	220	120	2,343	260	304	280	280	280	(a)	250	220
7	250	220	120	2,089	260	300	(a)	280	280	250	250	220
8	250	220	120	3,111	280	300	280	280	(a)	250	250	(a)
9	250	220	120	3,205	280	280	280	280	280	250	250	220
10	250	(a)	(a)	3,050	280	280	280	280	280	250	(a)	220
11	240	200	130	2,872	280	280	280	(a)	280	250	250	220
12	240	200	170	2,649	(a)	280	280	280	280	250	250	220
13	(a)	200	200	2,580	280	280	280	280	280	(a)	250	220
14	220	200	220	2,534	280	280	(a)	280	270	250	250	220
15	220	180	220	2,339	280	280	280	280	(a)	250	250	(a)
16	220	180	220	2,213	280	(a)	280	280	270	250	250	2,700
17	220	(a)	(a)	2,089	280	280	280	280	270	250	(a)	2,600
18	220	125	220	2,034	280	280	280	(a)	270	250	250	1,143
19	220	125	220	1,921	(a)	280	280	280	270	250	250	999
20	(a)	125	220	1,756	280	280	280	280	270	(a)	250	270
21	220	125	220	1,143	280	280	(a)	280	270	250	250	270
22	220	125	250	999	280	280	280	280	(a)	250	250	(a)
23	220	125	250	1,194	280	(a)	280	280	270	250	250	270
24	220	(a)	(a)	1,296	280	280	280	280	270	250	(a)	270
25	220	125	276	1,194	280	280	280	(a)	270	250	250	270
26	220	125	524	1,046	26	280	280	280	270	250	250	270
27	(a)	120	919	907	286	280	280	280	270	(a)	220	270
28	220	120	1,404	1,109	286	280	(a)	280	270	250	(a)	270
29	220	------	1,262	985	354	280	280	280	(a)	250	220	(a)
30	220	------	824	260	393	(a)	280	280	270	250	220	284
31	220	------	569	------	483	------	280	280	------	250	------	1,143
Mean	231	173	344	2,046	290	306	280	280	274	252	246	526

a Water shut back on Sunday when under control.

The following tables give the maximum, minimum, and mean monthly discharge of Cobbosseecontee River, and the rainfall and run-off of the basin. The means are computed for working days only, except when lakes are full and water is allowed to flow over the dams; but the run-off in second-feet per square mile and in depth in inches is computed for the full number of days in the month.

Estimated monthly discharge of Cobbosseecontee River at upper dam near Augusta, Me.

[Drainage area, 230 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1890.						
June 16 to 30	356	300	324	1.41	1.57	3.71
July	374	290	302	1.14	1.31	4.83
August	290	280	290	1.06	1.22	3.47
September	290	290	290	1.13	1.26	5.13
October	393	290	313	1.23	1.42	5.47
November	445	300	356	1.50	1.67	1.89
December	300	290	298	1.09	1.26	5.55
1891.						
January	1,120	290	516	2.10	2.43	8.10
February	942	363	576	2.41	2.51	3.89
March	2,585	515	1,385	6.02	6.94	7.03
April	2,169	300	1,277	5.55	6.19	2.89
May	316	300	301	1.10	1.27	2.60
June	300	300	300	1.13	1.26	3.64
July	300	290	293	1.06	1.22	5.27
August	290	285	286	1.04	1.20	2.97

Estimated monthly discharge of Cobbosseecontee River, etc.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1891.						
September	285	260	272	1.02	1.14	1.00
October	260	(a)	----	----	----	2.40
November	(a)	(a)	----	----	----	2.66
December	220	(a)	----	----	----	5.27
The year	----	----	----	----	----	47.72
1892.						
January	276	220	258	0.94	1.08	5.52
February	280	270	279	1.04	2.12	2.21
March	280	280	280	1.06	1.22	2.43
April	306	280	283	1.07	1.19	1.05
May	280	280	280	1.10	1.27	4.62
June	280	280	280	1.02	1.14	7.22
July [b]	280	280	280	0.79	0.91	3.18
August	280	280	280	1.06	1.22	8.11
September	280	280	280	1.06	1.18	4.48
October	280	280	280	1.02	1.18	1.81
November	280	280	280	1.02	1.14	4.54
December	280	280	280	1.06	1.22	1.49
The year	306	220	278	1.02	14.87	46.66
1893.						
January	280	280	280	1.02	1.18	2.70
February	280	280	280	1.09	1.13	4.79
March	780	280	422	1.71	1.97	3.18
April	1,079	300	629	2.65	2.96	2.52
May	2,680	307	1,025	4.46	5.15	4.66
June	300	280	287	1.08	1.21	2.56
July	280	280	280	0.98	1.13	1.12
August	280	270	272	1.03	1.19	3.27
September [c]	270	250	263	0.60	0.67	3.23
October [c]	250	220	236	0.56	0.65	5.90
November	250	220	225	0.82	0.92	1.83
December	220	220	220	0.77	0.89	5.13
The year	2,680	220	368	1.40	19.05	40.89
1894.						
January	220	220	220	0.84	0.97	3.30
February	220	220	220	0.82	0.85	1.99
March	900	220	364	1.48	1.71	1.44
April	430	300	303	1.19	1.33	1.86
May	862	280	333	1.31	1.51	5.84
June	925	280	350	1.42	1.58	1.18
July	280	280	280	0.98	1.13	2.30
August	280	280	280	1.06	1.22	3.08
September	280	270	272	0.94	1.05	3.81
October	270	250	251	0.91	1.05	4.25
November	250	250	250	0.91	1.02	2.21
December	250	250	250	0.88	1.01	2.80
The year	925	220	281	1.06	14.43	34.06
1895.						
January	250	250	250	0.95	1.10	2.50
February	250	220	223	0.80	0.83	1.64
March	220	220	220	0.71	0.82	2.48
April	2,619	250	785	3.41	3.81	4.83
May	385	280	287	1.05	1.21	1.50
June	280	280	280	1.02	1.14	2.01
July	280	280	280	1.02	1.18	4.55
August	280	270	273	1.04	1.20	3.28
September	270	(d)	----	----	----	1.21
October	220	(d)	----	----	----	1.82
November	220	(d)	----	----	----	6.85
December	343	220	222	0.97	1.12	4.40
The year	2,619	----	----	----	----	37.07
1896.						
January	451	270	277	1.01	1.16	0.87
February	280	270	272	1.02	1.10	5.25
March	2,698	644	1,138	4.95	5.71	7.19

[a] Water so low only gage record kept.
[b] Water shut back eleven days.
[c] Water shut back fourteen days.
[d] Gates up; natural flow; not measured.

Estimated monthly discharge of Cobbosseecontee River, etc.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1896.						
April	1,236	300	812	3.53	3.94	2.02
May	300	280	284	0.99	1.14	2.80
June	280	280	280	1.06	1.18	1.94
July	280	280	280	1.02	1.18	3.18
August	280	250	270	0.98	1.13	2.88
September	270	250	252	0.95	1.06	7.60
October	250	220	232	0.88	1.01	2.64
November	250	220	233	0.81	0.90	4.12
December	250	250	250	0.91	1.05	1.52
The year	2,698	220	382	1.51	20.56	42.01
1897.						
January	250	250	250	0.91	1.05	4.51
February	250	250	250	0.93	0.97	2.13
March	306	250	252	0.96	1.11	4.30
April	650	280	438	1.90	2.13	2.86
May	914	244	425	1.73	1.99	5.94
June	679	280	397	1.67	1.86	4.32
July	280	100	273	1.04	1.20	3.15
August	280	280	280	1.02	1.18	2.66
September	280	280	280	1.06	1.18	3.11
October	280	(a)	----	----	----	0.92
November	270	270	270	1.01	1.13	5.99
December	280	21	265	1.00	1.15	3.83
The year	914	----	----	----	----	43.72
1898.						
January	280	280	280	1.02	1.18	5.54
February	504	280	324	1.31	1.36	5.45
March	1,261	387	843	3.67	4.23	1.76
April	1,038	326	633	2.75	3.07	3.44
May	478	273	337	1.33	1.53	1.60
June	280	280	280	1.06	1.18	3.56
July	280	19	270	0.98	1.13	0.98
August	280	270	275	1.05	1.21	3.73
September	270	250	252	0.95	1.06	2.90
October	250	220	238	0.86	1.99	6.23
November	250	250	250	0.91	1.02	4.57
December	270	250	268	1.02	1.18	2.74
The year	1,261	19	354	1.41	19.14	42.50
1899.						
January	270	270	270	0.98	1.13	3.41
February	270	270	270	1.00	1.04	3.10
March	280	250	270	1.02	1.18	5.56
April	1,427	300	803	3.49	3.90	1.19
May	300	20	281	1.06	1.22	1.87
June	280	280	280	1.06	1.18	2.43
July	280	19	270	0.98	1.13	5.48
August	280	270	275	1.04	1.16	1.08
September	270	(a)	----	----	----	3.90
October	(a)	(a)	----	----	----	1.85
November	180	130	162	0.58	0.65	2.42
December	180	120	144	0.51	0.59	2.61
The year	----	----	----	----	----	34.90
1900.						
January	220	90	136	0.51	0.59	7.19
February	2,194	220	508	1.97	2.05	8.96
March	2,316	815	1,365	5.93	6.83	7.23
April	1,380	300	1,044	4.38	4.88	2.50
May	1,422	300	562	2.36	2.73	5.42
June	300	280	282	1.07	1.19	1.34
July	280	260	276	0.97	1.12	1.87
August	275	260	264	1.00	1.15	2.77
September	260	230	245	0.89	0.99	2.45
October	230	150	206	0.78	0.90	4.47
November	220	130	199	0.75	0.84	5.28
December	240	220	232	0.81	0.93	1.64
The year	2,316	90	443	1.79	24.20	51.12

(a) Gates up; natural flow; not measured.

Estimated monthly discharge of Cobbosseecontee River, etc.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1901.						
January	250	220	231	0.87	1.00	3.78
February	220	120	173	0.65	0.68	1.76
March	1,404	120	344	1.31	1.51	6.25
April	3,205	260	2,046	8.90	9.90	6.43
May	483	260	290	1.10	1.27	3.97
June	510	280	306	1.20	1.34	1.36
July	280	280	280	1.02	1.18	4.26
August	280	280	280	1.06	1.22	5.54
September	280	270	274	0.99	1.10	2.08
October	270	250	252	0.96	1.11	4.18
November	250	220	246	0.89	0.99	2.41
December	2,700	220	526	1.92	2.21	9.43
The year	3,205	120	437	1.74	23.51	51.45

Run-off, in second-feet per square mile, of Cobbosseecontee River at dam of Gardiner Water Company, near Augusta, Me.

[Drainage area, 230 square miles.]

Month.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Average.
January	------	2.10	0.94	1.02	0.84	0.95	1.01	0.91	1.02	0.98	0.51	0.87	1.01
February	------	2.41	1.04	1.09	0.82	0.80	1.02	0.93	1.31	1.00	1.97	0.65	1.19
March	------	6.02	1.06	1.71	1.48	0.71	4.95	0.96	3.67	1.02	5.93	1.31	2.62
April	------	5.55	1.07	2.65	1.19	3.41	3.53	1.90	2.75	3.49	4.38	8.90	3.53
May	------	1.10	1.10	4.46	1.31	1.05	0.99	1.73	1.33	1.06	2.36	1.10	1.60
June	1.41	1.13	1.02	1.08	1.42	1.02	1.06	1.67	1.06	1.06	1.07	1.20	1.18
July	1.14	1.06	0.79	0.98	0.98	1.02	1.02	1.04	0.98	0.98	0.97	1.02	1.00
August	1.06	1.04	1.06	1.03	1.06	1.04	0.98	1.02	1.05	1.04	1.00	1.06	1.04
September	1.13	1.02	1.06	0.60	0.94	------	0.95	1.06	0.95	------	0.89	0.99	0.96
October	1.23	------	1.02	0.56	0.91	------	0.88	------	0.86	------	0.78	0.96	0.90
November	1.50	------	1.02	0.82	0.91	------	0.81	1.01	0.91	0.58	0.75	0.89	0.92
December	1.09	------	1.06	0.77	0.88	0.97	0.91	1.00	1.02	0.51	0.81	1.92	0.99
The year	------	------	1.02	1.40	1.06	------	1.51	------	1.41	------	1.79	1.74	1.42

Ratio of run-off to rainfall in basin of Cobbosseecontee River.

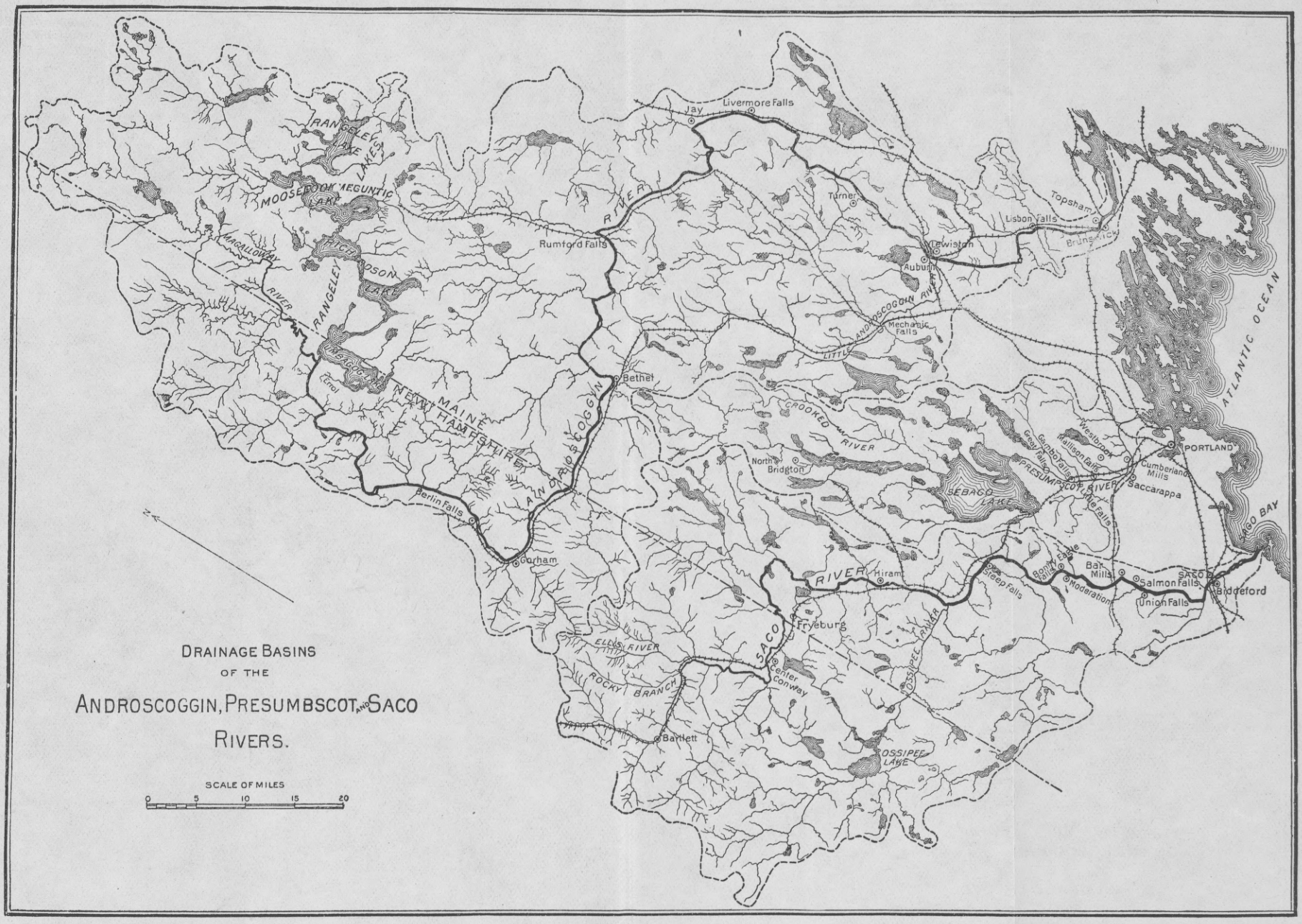
	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Average.
Precipitation, inches	[a]30.05	[b]37.39	46.66	40.89	34.06	[b]27.19	42.01	[c]42.80	42.50	[d]29.15	51.12	51.45	[e]44.10
Run-off, inches	[a]9.71	[b]24.16	14.87	19.05	14.43	[b]12.41	20.56	[a]14.95	19.14	[d]13.18	24.20	23.51	[e]19.25
Ratio	[a]0.32	[b]0.65	0.32	0.47	0.42	[b]0.46	0.49	[c]0.35	0.45	[d]0.45	0.47	0.46	0.44

[a] Seven months.
[b] Nine months.
[c] Eleven months.
[d] Ten months.
[e] Only full-year records used in obtaining averages.

ANDROSCOGGIN RIVER.

DRAINAGE BASIN.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley lakes near the Maine-New



DRAINAGE BASINS
OF THE
ANDROSCOGGIN, PRESUMBSCOT, AND SACO
RIVERS.

SCALE OF MILES
0 5 10 15 20

Hampshire boundary line. For about 35 miles it flows southward, into the State of New Hampshire, then turns abruptly to the east and flows into the State of Maine, then turns to the south and joins the Kennebec in Merrymeeting Bay. (See Pl. X.) The total drainage area above Brunswick, where is the last fall, is 3,700 square miles, about 80 per cent of which is in Maine. The greatest length of the basin is 110 miles, the greatest width 70 miles, while the river itself measures about 200 miles in length from the sources of Magalloway River to the coast. The following table gives the drainage areas of the river at various points, and of some of its chief tributaries:

Drainage areas of Androscoggin River and principal tributaries.

River.	Locality.	Dainage area.
		Sq. miles.
Androscoggin	Immediately below junction of Umbagog outlet and Magalloway River.	1,180
Do	Berlin Falls	1,480
Do	Rumford Falls	2,220
Do	Livermore Falls	2,690
Do	Lewiston	3,120
Do	Brunswick	3,700
Little Androscoggin	Mouth	380
Magalloway	Mouth	420
Umbagog outlet	Immediately above junction with Magalloway River	760

The lower part of the basin is hilly and moderately wooded, while the upper two-thirds is very broken and mountainous, heavily timbered, and with a gravelly, sandy soil. Granite, gneiss, and mica-schists abound along the main course of the river, with clay slate in the upper part of the basin. The bed of the river, like that of all streams on the southern slopes of Maine, is generally rocky, particularly where falls occur, with high banks, seldom subject to overflow, all of which are features of advantage in the development of water powers. Below Berlin Falls the stream is nowhere more than 10 miles from a railroad, and for considerable portions of its course it is immediately skirted by railroads. Tide-water navigation extends about 6 miles above the mouth, or to the falls at Brunswick.

LAKE STORAGE.

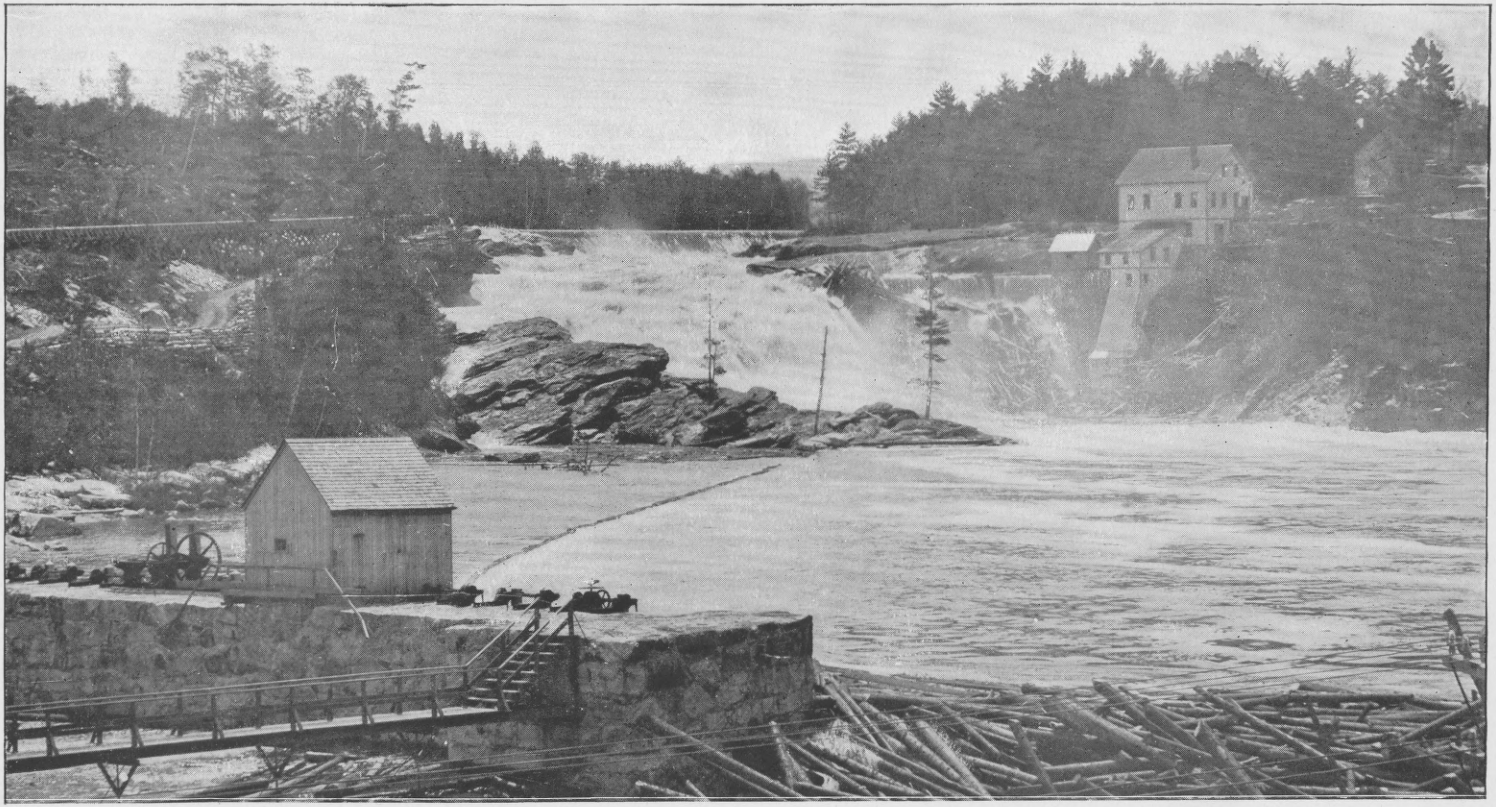
Nearly one-seventeenth of the total area of the basin is in lake surfaces, there being 148 lakes, with an aggregate area of 312 square miles. The largest of these is the Umbagog-Rangeley series, four large bodies of water discharging one into another and finally into the Androscoggin, commanding at the foot of the chain a drainage area of 760 square miles, exclusive of the Magalloway, or 1,180 square miles including that stream, and comprising a combined water surface of at least 80 to 90 square miles. To regulate the flow, the Union

Water Power Company, of Lewiston, has built a dam below the mouth of the Magalloway, by means of which the waters of the latter stream can be turned back into Umbagog Lake. The annual variation in the level of Rangeley Lake, as the highest lake of the chain is known, is seldom as great as 3 feet, but from the Mooselookmeguntic, the second lake, 25 feet lower than Rangeley Lake, the available draft from the high-water level is stated to be 18 feet. From Richardson Lake, the third lake of the series, lying about 20 feet lower than the preceding lake, 22 feet can be drawn, and from Umbagog, the lowest lake of the chain, and lying about 200 feet lower than Richardson Lake, 12 feet. Besides the lakes of the Umbagog-Rangeley chain there are many others of smaller size, ranging in extent from 6 or 8 square miles downward, and covering in the aggregate, according to Wells, about 136 square miles of surface.

The exceedingly mountainous character of the upper basin, with its extensive exposures of bare rock, tends to give the river a high freshet discharge and a variable flow, a tendency which is offset to a considerable extent by the dense forest covering, the large lake storage, and the holding back, by means of dams, of the freshet waters above Rumford Falls. Wells gives the range between high and low water as 8 or 10 feet on the falls at Brunswick and Lewiston, 20 feet at Rumford Falls, and from 22 to 28 feet at Bethel. But at Rumford Falls there is no record of such a rise as that stated. In April, 1895, when the water at other points along the river was as high as any of the traditions declared it had ever been, the rise on the dams at Rumford Falls was only 10.80 feet.

WATER POWERS.

In general the elevation of the basin is greater than that of any other watershed on the Atlantic coast. The outlet of Umbagog Lake is at an elevation of 1,256 feet, while the Rangeley Lakes are about 1,500 feet above the sea. The sources of Magalloway River are from 2,600 to 2,900 feet in elevation. Thus the entire fall of the river, from the level of Umbagog Lake to tide water at Brunswick, amounts to about 1,250 feet, and in the various stretches for which detailed figures are obtainable the fall ranges generally between 4½ and 7½ feet to the mile. At three important points, however, there are large concentrated falls, namely, at Lewiston, where a natural fall of 38 feet in 600 feet is increased to 50 feet by a dam; at Rumford Falls, where there is a natural descent of 177 feet in about a mile, and at Berlin Falls, where the fall is said to amount to nearly 200 feet in a mile. The following table gives the elevations at various points:



UPPER AND LOWER DAMS AT RUMFORD FALLS.

Fall in Androscoggin River.

Locality.	Distance from tide water at Brunswick.	Height above mean tide.	Fall between points.	Distance between points.	Average fall per mile between points.	Authority.
	Miles.	*Feet.*	*Feet.*	*Miles.*	*Feet.*	
Foot of Umbagog Lake	158	1,256				
			208	31	6.7	Wells: The Water-Power of Maine, p. 79.
Head of Berlin Falls	127	1,048				
			281	6	47.0	Joseph Hobson, chief engineer Grand Trunk Railway.
Gorham, N. H	121	[a] 767				
			77	11	7.0	
State line	110	690				Wells: The Water-Power of Maine, p. 79.
			70	12	5.8	
Bethel	98	620				
			23	22	1.0	
Head of Rumford Falls	76	597				C. A. Mixer, engineer Rumford Falls Power Company.
			177	1		
Foot of Rumford Falls	75	420				
			256	53	4.8	
Lewiston, head of Falls	22	[b] 164				H. C. Robinson, assistant engineer Maine Central Railroad.
			164	22	7.5	
Brunswick	0	0				

[a] Water surface at summer stage at Grand Trunk Railway crossing.
[b] Corrected for water surface from elevation of track at Maine Central Railroad bridge.

The amount of power utilized on the Androscoggin in 1880 was given in the census report of that year as from 13,000 to 14,000 horsepower. The increase since that time has been very great, as shown by figures given herein. The total amount now used is greater than upon any other stream in New England. Probably more than two-thirds of it is employed in the manufacture of wood pulp and paper, and it is almost exclusively in that line that the development of the river in recent years has taken place. This growth seems natural when it is considered that the Upper Androscoggin Basin contains the finest spruce forests in New England. In the third annual report of the forest commissioner of Maine, Mr. Austin Cary places the net area of spruce-producing land in the Androscoggin Basin in Maine at 830 square miles, not more than half of which has been cut for spruce, while the 850 square miles or thereabouts of the gross area of the basin lying in New Hampshire is or has been a spruce-bearing region. Large inroads are, however, now being made into the spruce of this basin, as well as of others in Maine, and it is hoped that before the scarcity of this wood is felt too severely either the State or the companies will appreciate the advantages of careful cutting under the supervision of a trained forester. Under the guidance of an expert, cutting could go on from year to year without seriously affecting the available supply, but if all the forests are ruthlessly cut the spruce of Maine will be entirely destroyed in the not distant future, and the great industries depending upon that wood will cease.

Ascending from the mouth of the river, the first fall is at the head of tide water at Brunswick. Here there is a dam giving a fall of

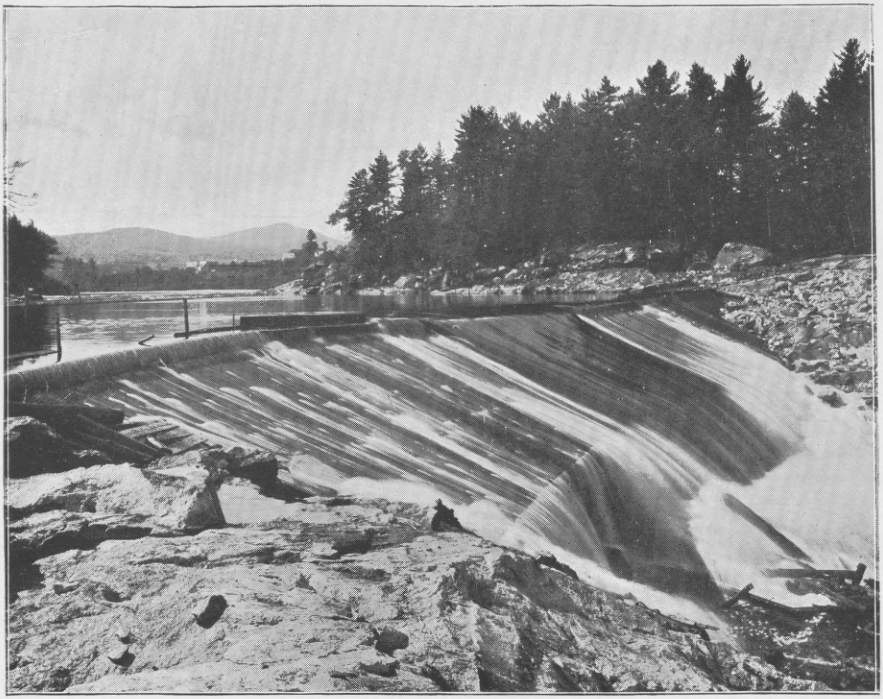
about 15 feet, which is liable to a reduction of about 3 feet from the tide. The largest user of power is the Bowdoin Paper Manufacturing Company, employing 750 horsepower on the north bank, where there is also a sash, door, and blind factory. At the south or Brunswick end of the dam are the mills of the Androscoggin Pulp Company, a gristmill, a sawmill, a sash and blind factory, and a ferrule shop. The aggregate power used could not be learned.

The second or upper dam at Brunswick is a short distance above the dam just mentioned, and gives a fall of 18 feet. This privilege is owned by the Cabot Manufacturing Company, which uses 1,700 horsepower in its cotton mills and leases power to the Brunswick Electric Light Company, lighting Brunswick and Topsham, and employing two 500-horsepower turbines. No lack of water at this privilege has ever been experienced.

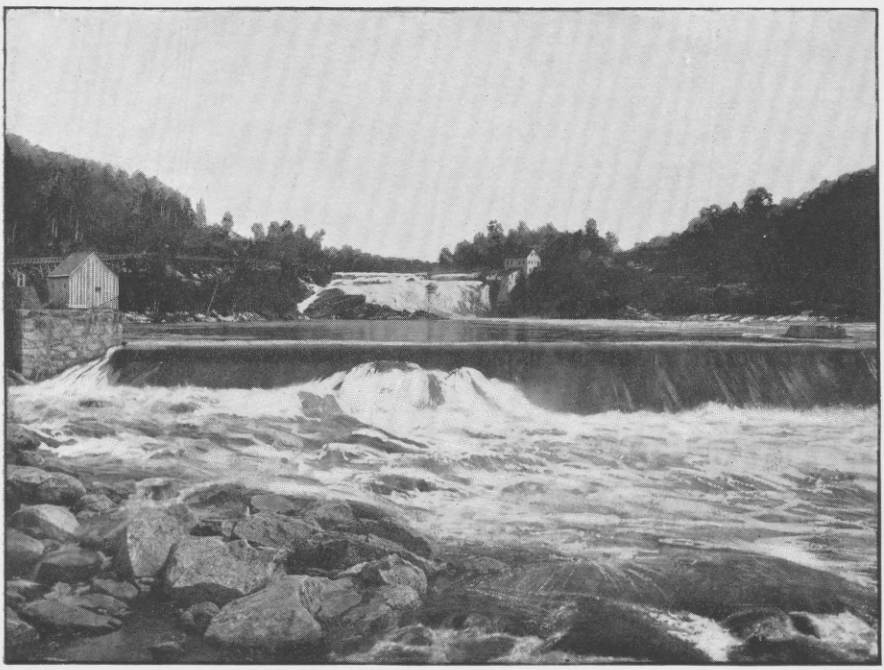
A half mile above the Cabot Manufacturing Company's dam are rapids with a fall of 7 feet; and a few miles farther is the Pejebscot Mills privilege, which has been developed within the last three or four years for the manufacture of pulp and paper, and at which a fall of 20 feet and 4,000 horsepower are in use.

At Lisbon Falls, about 11 miles below Lewiston, there are two dams. At the lower dam 14 feet fall and 875 horsepower are utilized by the Lisbon Falls Paper Manufacturing Company, while at the upper dam 13 feet fall and 1,050 horsepower are employed, about three-fourths of it in the woolen mill of the Worumbo Manufacturing Company.

The next power is that at Lewiston, 22 miles by river above tide water at Brunswick, owned by the Union Water Power Company. At this point the river had naturally a fall over a rocky bed of about 38 feet in a few hundred feet, and by a dam at the head of the falls this has been raised to 50 feet. Above the dam the pond is only 1½ miles in length, and is of insufficient capacity to store completely the night flow in dry weather. The power is used on the left bank from two levels, the upper canal being 4,200 feet long and the lower canal 1,600 feet long. The city of Lewiston has the right to 450 horsepower net for pumping its water supply from the river, and to 150 horsepower net for the purpose of electric street lighting. The water-power company also maintains on the lower level a mill from which it leases considerable quantities of power. The main employment of power, however, is by large cotton mills (comprising the Continental, the Androscoggin, the Bates, the Hill, the Lewiston, the Lincoln, and the Avon), the Lewiston bleachery and dye works, and the Cowan & Company, the Columbia, and the Cumberland woolen mills. Power is leased by the water-power company at rates varying from $5 to $12.50 per horsepower per annum, the cheaper rates being for the original corporations. The price applies to net power on the shaft, assuming the latter to be 75 per cent of the gross power of a given



A. UPPER DAM AT RUMFORD FALLS.



B. LOWER DAM AT RUMFORD FALLS, AT ENTRANCE TO MIDDLE-LEVEL CANAL.

quantity of water and fall. The mills run sixty hours a week, and measurements of the water power used by them are made daily. Some auxiliary steam power is also in use at some of the mills.

The total demand for water from the upper level when all of the plants are running at full capacity is between 3,100 and 3,200 cubic feet per second for about sixty hours a week. Assuming 3,150 cubic feet per second used on the full fall of 50 feet, we find the corresponding power to be about 18,000 gross or 13,500 net horsepower; but as some water is used on only a part of the total fall, the utilized power is reckoned at from 15,000 to 16,000 gross, or, say, 12,000 net horsepower sixty hours in the week. For a large part of the year the available power is of course much in excess of the figures given.

At Deer Rips a dam is being constructed which will make available a fall of 28 feet; this is to be utilized for electric power in Lewiston. At the Crooked Rips, 5 or 6 miles above Lewiston, opposite the town of Turner, there is a dam, built a few years ago, giving a moderate fall, but now serving no useful purpose.

The next utilized power is at Livermore Falls, about 25 miles above Lewiston, where approximately 3,000 horsepower is in use, the major portion of it (2,500 horsepower) in the mills of the Livermore Falls and Umbagog pulp companies, and the remainder temporarily in an electric-light station. The head realized is about 16 feet, but rapids extending downstream indicate that a considerable additional fall (about 25 feet) is available.

In the 25 miles between Livermore Falls and Rumford Falls are three large water powers devoted to the manufacture of pulp and paper. At Otis Falls 24 feet fall and 8,000 horsepower are employed by the Otis Falls Pulp Company, which has developed 18 feet fall farther upstream, at the Petersons Rips, where 6,000 horsepower is available. Between these two privileges, at Jay, the Jay Paper Manufacturing Company uses 15 feet fall and 3,700 horsepower.

At Rumford Falls there is one of the finest water powers on the Atlantic coast. Here the Androscoggin descends 177 feet in 1 mile, in several pitches over granite ledges. A comprehensive plan of development has been laid out and partially executed. It contemplates the use of power from three levels—a high-level canal, with a fall of 97 feet, to the middle level, the latter receiving also a direct and independent supply of water from the river, the water to be used from the middle-level canal and discharged, after a fall of 50 feet, into the low level, from which in turn there is a final drop of 30 feet to the river. Dams have been built at the entrance of the high and middle level canals. (See Pls. XI and XII.) Water for power was first used in important amounts in the summer of 1893, and its use increased from time to time, so that at present about 19,000 horsepower is in use, the greater part being utilized in the manufacture of pulp and paper. (A view of the city, looking downstream toward the

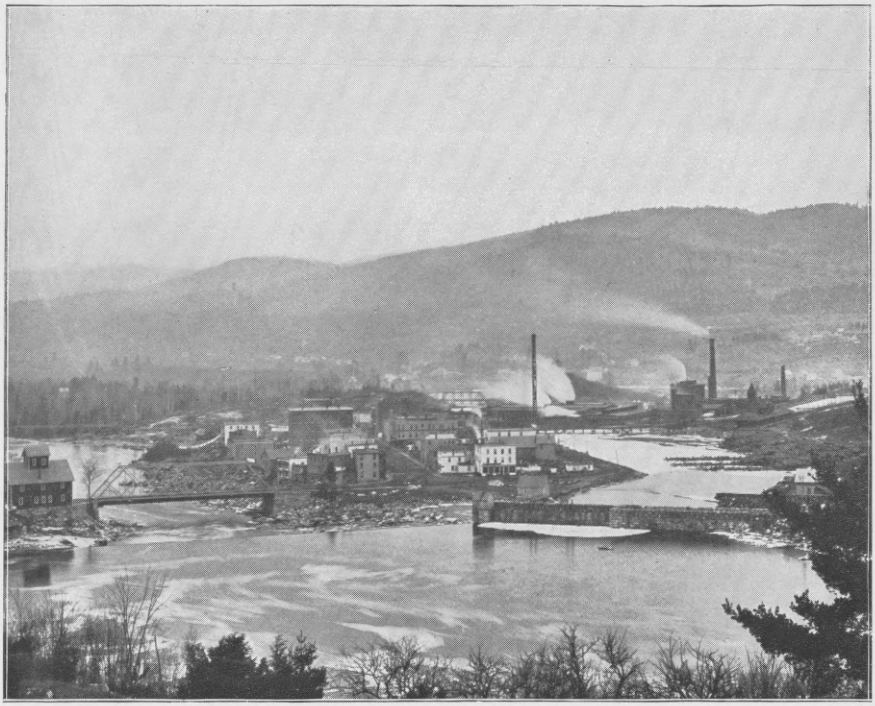
middle-level canal, is shown in Pl. XIII, *A*, and a description of the works is given in the Nineteenth Annual Report of the United States Geological Survey, Part IV.) If the entire fall of 177 feet were utilized there would be available, at Rumford Falls, from 30,000 to 54,000 horsepower. This power is 85 miles, by rail, from Portland, and for pulp and paper manufacture has the advantage of excellent transportation facilities—Androscoggin River, for floating down pulp wood and timber from the headwaters to the mills, and the Rumford Falls and Rangeley Lakes Railroad, extending into the forests, with a contemplated extension into the Megantic region which will make available additional spruce, poplar, and birch forests. Altogether Rumford Falls possesses the greatest water power in the New England States. Much of it is now unutilized, but it is likely that before long the city of Rumford Falls will be a great manufacturing center.

Passing upstream, the next use of power on the Androscoggin is at Berlin Falls, N. H., where the river has a rapid descent over a rocky bed, stated to be nearly 200 feet in 1 mile. The first power is that of the Glen Manufacturing Company, which has 3 dams in succession, giving falls of 22, 22, and 38 feet, the power being employed in the manufacture of paper and pulp. Then follows an unimproved privilege, succeeded by the works of the Burgess Sulphite Fiber Company, using a fall of 16 feet. Above these are the paper, pulp, and saw mills of the Berlin Mills Company, which obtain power from 3 dams, the aggregate fall being about 50 feet. The mills at Berlin are among the largest of their kind in the country. They employ in the aggregate about 20,000 horsepower of turbines, and their combined output in twenty-four hours comprises about 140 tons of wood pulp, 210 tons of sulphite fiber, and 160 tons of finished news paper. In addition to this the Berlin Mills Company manufactures about 40,000,000 feet of finished lumber per annum.

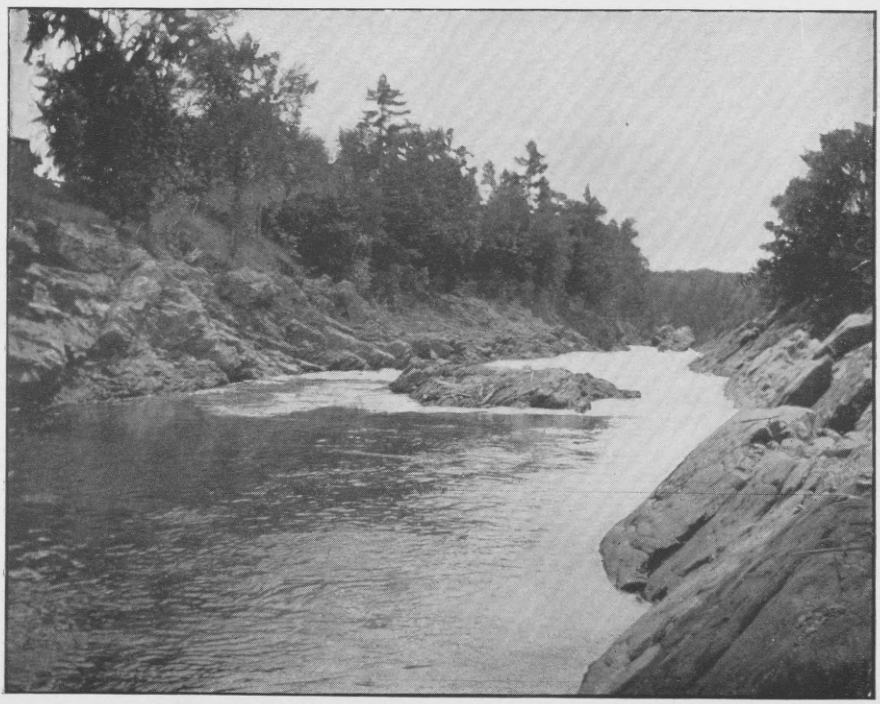
Above Berlin Falls no power is used from the Androscoggin, and the stream is without immediate railroad facilities. There is a dam, however, at Pontoocook Falls, 10 or 12 miles above Berlin, used for logging purposes, and within about 2 miles of which there is said to be 60 or 70 feet of fall in the river. At Errol, also, there is a dam which serves to control the storage in Umbagog Lake, as elsewhere mentioned.

FLOW.

No figures of value regarding the flow of Androscoggin River are available, except those resulting from a series of observations begun at Rumford Falls in May, 1892, during the progress of power developments at that place, and continued to the present time. Until January, 1893, the discharge was determined from the computed flow over the dam, as given by the Francis ordinary weir formula, modified for the form of the crest. Subsequent to that time, as water came to be used for power, additions of the amounts assumed to pass through the turbines were made to the computed flow over the dam.



A. RUMFORD FALLS, LOOKING DOWNSTREAM TOWARD MIDDLE-LEVEL CANAL.



B. SACO RIVER BELOW SALMON FALLS DAM.

Gage ratings are taken at the lower dam. At first they were made once a day, later four times a day, and now every two hours. Flashboards are not used on the dam. There is but little fluctuation during the twenty-four hours in the quantity passing the weirs; in fact, there is not much fluctuation anywhere upon the river except at and below Lewiston, where a large proportion of the mills run only in the daytime, while elsewhere the mills run continuously through the week. At Rumford Falls many of the turbines run throughout the week without change of gate, and some of them run for a month or two at a time without stopping. Notwithstanding the fact that a high degree of accuracy is not expected, and doubtless is not claimed for results obtained by this method, in which, for example, the proper weir coefficient to be used is in doubt, the results obtained at Rumford Falls are of high value as giving a good approximation of the actual volume of the river. The measurements, which are given in accompanying tables, have been placed at the disposal of the Survey by Mr. Charles A. Mixer, resident engineer of the Rumford Falls Power Company.

The year 1899 was remarkable for its small rainfall. According to Mr. Mixer, the departure of the precipitation of that year from the normal, which is taken as 43.41 inches, was a deficiency of 27 per cent, the total fall being only 31.58 inches. This emphasizes the importance of water storage, not only to tide over these rare periods of deficient flow, but also to equalize the fluctuations from month to month during every year. The lowest monthly run-off, 0.71 inch in depth, was in August, the month of greatest evaporation, and it was 0.07 inch more than the precipitation. The lowest daily discharge for the year, 1,124 second-feet, was 0.48 second-foot per square mile. The total annual run-off averaged 53 per cent of the total precipitation as measured at Rumford Falls, but in 1899 the percentage rose to 59, the increase presumably being due to storage. The records of precipitation have not been kept for a sufficiently long period to give a wide range in fluctuation, but judging from the effects on the wells there had been no such period of drought for from fifty to seventy-five years. The following table gives a comparison of the rainfall at Rumford Falls for the year 1899, with the normal rainfall of the years preceding:

Comparison of rainfall at Rumford Falls, Me.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Normal	3.23	4.28	3.55	2.99	3.92	3.63	4.48	3.49	3.34	2.78	4.74	2.98
1899	3.18	2.56	5.89	1.50	1.59	2.27	4.71	0.64	3.00	2.05	1.94	1.95
Normal accumulation	3.23	7.51	11.06	14.05	17.97	21.60	26.08	29.57	32.91	35.69	40.43	43.41
1899 accumulation	3.18	5.74	11.63	13.13	15.02	17.29	22.00	22.64	25.64	27.69	29.33	31.58
Accumulated excess			0.57									
Accumulated deficiency	0.05	1.77		0.88	2.95	4.31	4.08	6.93	7.27	8.00	10.80	11.83

During the year there are generally two low-water seasons, one in January and the other in September. The two periods of low water are each short, thus reducing the requirements for storage, and resulting in rapid increase of efficiency of every storage project. Observations of rainfall at Rumford Falls give the results shown in the following table. These figures include rain and melted snow, and can not be considered strictly representative of the precipitation over the whole catchment basin, as the elevation of the rain gage is 512 feet, while the catchment surface is higher, ranging from 600 feet upward in the portion of the drainage basin which is without storage, which aggregates about half of the entire area. The other half of the basin, within which are lakes and other facilities for storage, averages in elevation about 1,450 feet.

Rainfall, in inches, at Rumford Falls, Me.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1893												3.00	
1894	2.40	1.85	1.57	1.20	5.55	3.20	5.15	4.30	4.35	3.95	4.25	2.70	40.47
1895	3.50	0.60	1.06	5.60	4.40	2.30	2.15	3.10	2.05	1.60	5.40	5.71	37.47
1896	1.10	5.85	9.75	1.65	2.07	1.75	2.75	3.15	4.40	3.20	2.95	0.95	39.57
1897	3.80	2.70	4.05	3.35	4.25	6.20	9.44	2.15	1.93	0.63	5.35	3.40	47.25
1898	3.85	7.25	1.08	2.87	2.55	3.05	2.70	3.39	3.96	4.52	5.00	1.95	42.17
1899	3.18	2.56	5.89	1.50	1.89	2.27	4.71	0.64	3.00	2.05	1.94	1.95	31.58
1900	5.80	7.96	5.82	1.21	4.57	3.35	4.35	2.42	2.31	3.91	7.22	1.15	50.07
1901	2.77	0.74	4.05	7.91	6.54	3.84	4.91	3.47	2.59	3.48	1.76	5.53	47.59

In addition to the annual storage in lakes there is another form of storage resulting from the prevailing low temperature of the basin. The winter precipitation, which is chiefly in the form of snow, is nearly all retained for a period of weeks or months, and by melting in the spring is rapidly added to the rainfall of that season. Thus the ratio between rainfall and run-off during the winter and spring means little or nothing. By yearly periods, however, the comparison, as shown in the following table, is of interest:

Ratio of run-off to rainfall in basin of Androscoggin River.

	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Average.
Rainfall, inches	[a]31.86	36.26	39.48	37.27	39.83	45.36	42.17	31.58	50.07	47.59	41.07
Run-off, inches	[a]17.47	27.34	22.29	20.91	22.60	23.91	22.04	18.37	22.66	24.87	22.78
Ratio	[a]0.55	0.75	0.56	0.56	0.57	0.53	0.52	0.58	0.45	0.52	0.56

[a] Seven months—June to December.

The records of discharge of the Androscoggin indicate on the whole a very constant flow, maintained for more than half of the time between 2,000 and 4,000 cubic feet per second, and between substantially 1 and 2 cubic feet per square mile of drainage area.

It is true that during February and March, 1895, the discharge continued as low as about 1,200 cubic feet per second, or 0.55 cubic foot per second per square mile. This is described, however, as a very unusual condition, resulting from the withdrawal of lake storage in the early winter until it was exhausted, for the first time since the dams were built at the lakes, a period of twenty-five years, followed by severe and continued cold weather, holding all surface moisture in the form of snow and ice and even checking the flow of springs. On the other hand, within ten days after the close of this period of low flow, or in April, 1895, the river was visited by a freshet described by Mr. Mixer as the highest in thirty years. The discharge rose to 55,000 cubic feet per second, or about 25 cubic feet per second per square mile of drainage area. The ratio of these extremes, about 45 to 1, is probably not unlike that for other reservoir-fed streams of New England, such as the Merrimac and the Connecticut, but it is widely different from that of Southern nonreservoir streams, such as the Potomac.

Daily discharge, in second-feet, of Androscoggin River at Rumford Falls, Me.

[Drainage area, 2,320 square miles.]

1892.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1						6,500	16,300	3,200	5,860	2,700	2,580	3,830
2						7,000	11,800	3,450	5,860		2,820	3,580
3						5,540		3,450	5,240	2,700	3,060	2,820
4						6,500	16,700	3,450		2,700	4,080	
5						6,150	17,500	3,450	4,940	2,940	3,830	3,050
5						6,150	14,800	3,450	4,940	2,940		3,580
7						6,150	12,600		4,350	2,940	2,820	3,580
8						5,540	12,000	3,320	4,080	2,700	3,060	3,830
9						5,540	11,000	2,820	3,580		5,860	3,830
10						4,360		2,820	3,580	2,700	4,650	3,200
11						4,080	10,000	2,600		2,700	3,320	
12						4,350	9,300	4,080	3,200	2,700	2,820	3,200
13						3,830	6,500	4,350	3,200	2,700		3,200
14						3,830	6,500		3,200	2,700	2,330	3,200
15						3,830	5,240	5,870	8,000	2,700	2,580	3,200
16						4,080	4,940	5,870	4,940		4,650	2,940
17						3,830		4,940	4,080	2,700	24,500	2,940
18					5,860	4,080	4,650	4,940		2,700	13,000	
19					5,550	3,830	3,830	4,350	3,300	2,700	16,300	2,940
20					4,940	4,080	4,080	4,650	3,050	2,700		2,940
21					4,940	11,000	3,700		2,580	2,700	8,300	2,940
22					5,540	11,200	3,700	5,540	3,060	2,700	7,500	2,940
23					7,500	7,500	3,700	4,650	3,830		5,550	2,940
24					11,700	6,500		4,650	3,330	2,940	4,950	2,940
25					9,300	7,000	3,950	4,350		2,940	4,080	
26					8,600	13,000	3,950	8,500	3,080	2,940	4,350	
27					8,900	11,300	3,580	8,500	3,830	2,940		2,940
28					9,300	15,800	3,320		3,580	2,940	4,350	2,940
29					8,600	19,900	2,820	8,500	3,060	2,940	3,830	3,200
30					8,000	19,900	4,660	8,500	3,060		3,580	3,200
31					8,500			6,500		2,700		3,200
Mean					7,660	7,410	7,730	4,840	4,030	2,780	5,720	3,200

Daily discharge, in second-feet, of Androscoggin River, etc.—Continued.

1893.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2,990	2,990	2,870	9,560	5,040	3,310	2,840	3,760	.....	3,570	3,820
2	3,580	2,990	2,750	.....	11,460	5,040	.....	2,840	3,260	2,900	3,570	2,860
3	3,580	2,990	2,750	3,250	11,460	4,450	3,310	3,080	.....	2,450	3,340	.....
4	3,830	2,990	2,750	3,250	11,760	.....	3,580	2,840	2,560	2,450	3,340	1,900
5	3,200	.....	.....	2,750	25,460	4,750	3,630	2,580	2,360	2,860	.....	2,260
6	2,940	2,990	2,750	2,750	17,060	4,750	3,580	2,840	2,560	2,660	3,080	2,260
7	2,940	2,990	2,990	2,750	.....	5,040	3,580	3,820	2,760	2,260	3,080	2,860
8	.....	2,990	2,990	2,750	14,260	6,250	3,310	3,820	3,270	.....	3,340	2,460
9	2,940	2,990	2,990	.....	14,260	4,750	.....	2,840	3,530	2,750	3,340	2,460
10	2,940	2,990	2,990	5,910	17,060	5,040	3,310	2,840	.....	2,660	2,870	.....
11	3,200	2,990	2,990	4,700	24,060	.....	3,580	2,580	2,560	2,860	2,670	2,260
12	3,200	.....	.....	5,910	27,860	9,700	2,590	2,580	2,560	2,660	.....	2,060
13	3,200	2,990	3,250	7,050	27,860	8,400	2,590	2,840	3,040	2,660	2,670	2,260
14	3,200	2,990	4,130	7,050	.....	7,100	2,120	2,370	2,350	4,340	2,460	2,260
15	.....	2,990	4,130	8,050	28,460	7,100	2,310	1,960	2,160	.....	2,670	2,460
16	3,200	2,990	3,880	.....	25,060	6,660	.....	1,600	2,570	6,840	2,770	2,460
17	3,200	2,990	3,250	5,000	30,460	5,650	2,310	1,600	.....	3,580	2,770	.....
18	3,200	2,990	3,250	4,700	38,060	.....	2,120	1,750	3,280	4,320	2,770	2,460
19	3,200	.....	.....	4,700	26,060	4,450	2,590	2,580	3,280	3,670	.....	2,460
20	3,200	2,990	3,250	4,400	21,060	5,950	2,590	2,870	2,560	3,080	2,860	2,460
21	3,200	2,990	3,250	5,000	.....	5,100	2,820	3,560	2,560	3,080	2,860	2,460
22	.....	2,990	3,250	5,290	16,760	5,350	2,590	3,060	2,360	.....	3,340	2,260
23	3,200	2,990	3,250	.....	14,260	5,350	.....	3,060	2,160	3,340	3,080	2,260
24	3,200	2,990	2,990	5,590	13,060	5,740	2,590	3,060	.....	4,330	2,680	.....
25	3,200	2,990	2,990	5,910	9,660	.....	2,810	4,080	2,300	13,000	2,060	3,820
26	3,200	.....	.....	5,590	8,860	8,400	3,070	4,850	2,360	6,450	.....	2,860
27	3,200	2,990	3,370	6,550	6,560	6,250	2,590	4,080	3,040	4,320	1,900	3,340
28	2,940	2,990	3,380	7,050	.....	5,640	2,590	3,320	2,150	4,060	2,460	3,080
29	.....	.....	3,110	7,050	5,610	3,680	2,820	3,080	2,350	.....	4,830	3,080
30	2,940	.....	3,370	.....	5,610	3,160	2,330	12,300	2,350	4,830	4,320	3,080
31	2,940	.....	3,060	.....	5,110	.....	2,820	4,850	.....	3,820	.....	.....
Mean	3,180	2,990	3,190	5,030	17,290	5,720	2,870	3,300	2,690	3,935	3,030	2,630

1894.

1	3,570	2,130	1,680	.....	13,730	9,430	.....	1,680	1,980	1,680	7,380	1,880
2	3,570	2,130	1,570	4,290	13,730	9,830	3,110	1,750	.....	1,570	5,060	1,980
3	2,290	1,980	1,570	4,050	14,230	.....	2,280	1,980	1,830	1,730	4,560	1,980
4	2,290	.....	.....	4,050	11,730	9,830	5,310	2,130	1,980	1,980	.....	2,030
5	2,490	2,130	1,980	3,570	10,530	6,730	3,810	.....	1,980	1,680	5,060	2,030
6	2,700	2,130	2,130	3,900	9,730	5,880	3,090	1,380	1,930	1,460	4,050	2,180
7	.....	1,980	3,310	3,570	8,530	5,580	2,280	1,680	1,830	.....	3,300	2,280
8	2,490	2,130	5,880	.....	8,530	5,310	.....	2,030	1,680	1,680	2,890	1,570
9	2,490	2,280	5,310	3,570	7,730	4,810	2,480	2,280	.....	1,780	3,100	.....
10	2,280	2,130	5,310	3,300	7,380	.....	2,700	2,480	3,800	5,580	2,930	1,980
11	2,280	.....	.....	3,570	7,080	4,810	2,480	2,130	2,890	4,050	.....	1,830
12	2,280	2,280	4,550	3,570	5,880	3,100	3,310	.....	1,980	2,890	3,300	2,480
13	2,130	1,680	5,310	3,570	.....	4,060	2,280	1,830	1,630	3,800	2,890	2,890
14	.....	1,980	3,800	3,570	5,070	4,060	2,130	1,980	1,630	.....	2,280	2,730
15	2,280	1,680	4,560	4,300	4,550	3,800	.....	2,130	1,680	3,100	2,730	2,530
16	2,280	2,310	3,800	5,880	4,550	3,800	2,480	2,130	.....	2,690	2,530	.....
17	2,130	1,680	3,570	7,730	5,070	.....	2,280	2,130	1,680	2,890	2,730	2,280
18	2,130	.....	.....	9,030	4,810	4,550	2,480	2,280	1,830	2,890	.....	2,030
19	2,130	1,980	3,570	12,530	4,570	6,170	1,980	.....	2,180	2,530	3,100	2,130
20	3,310	1,980	5,570	17,730	.....	5,310	1,830	2,130	5,880	2,480	1,830	2,730
21	.....	1,980	7,090	22,230	6,170	5,310	3,300	1,980	3,310	.....	1,930	2,330
22	3,310	1,830	5,570	.....	6,170	4,550	.....	1,880	2,480	2,280	2,700	1,460
23	3,310	1,680	5,310	20,630	5,880	3,800	1,980	1,680	.....	2,280	2,700	.....
24	3,570	1,680	4,300	19,230	5,880	.....	1,830	1,680	2,280	2,280	2,890	1,880
25	3,570	.....	.....	18,730	6,470	3,100	1,830	1,730	2,130	2,330	.....	2,030
26	3,310	1,680	4,300	16,530	11,630	3,100	2,130	.....	1,830	2,690	2,490	1,980
27	3,310	1,680	4,050	15,230	.....	3,100	2,130	1,680	1,880	2,130	1,680	1,480
28	.....	1,570	3,800	16,930	5,880	4,050	2,280	1,680	1,830	.....	2,130	1,880
29	2,890	.....	3,570	.....	5,070	4,600	.....	1,880	1,680	2,180	1,460	1,980
30	2,890	.....	3,800	14,930	19,230	4,050	1,830	1,830	.....	2,280	1,380	.....
31	2,280	.....	3,570	.....	10,830	.....	1,680	2,030	.....	.....	.....	1,830
Mean	2,720	1,950	4,030	9,470	8,240	5,100	2,510	1,930	2,230	2,500	3,040	2,090

Daily discharge, in second-feet, of Androscoggin River, etc.—Continued.

1895.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,130	1,460	1,230	1,330	10,780	5,030	2,010	1,870	------	6,380	1,730	4,970
2	2,180	1,380	1,230	1,230	9,060	------	2,000	1,980	1,400	3,700	2,160	4,870
3	2,130	------	------	1,230	7,780	4,430	1,950	2,000	1,450	2,570	2,310	5,980
4	2,130	1,330	1,230	1,330	9,060	4,350	2,300	------	1,860	2,570	1,860	2,870
5	2,530	1,230	1,230	1,230	------	4,010	2,090	1,900	1,710	2,690	1,860	2,850
6	------	1,230	1,230	1,230	9,350	3,760	1,890	1,860	1,700	------	1,860	2,810
7	2,130	1,230	1,230	2,130	8,330	3,400	------	1,660	1,840	2,360	2,020	2,830
8	2,030	1,230	1,230	3,100	7,570	3,230	2,020	1,640	------	2,200	2,530	2,880
9	1,980	1,230	1,230	15,030	7,770	------	2,000	1,600	1,550	2,200	2,290	2,400
10	1,830	------	------	9,730	7,880	3,100	1,960	1,760	1,710	2,200	6,440	2,190
11	1,680	1,230	1,230	6,790	6,390	2,700	2,010	------	1,620	2,180	5,190	2,250
12	1,570	1,230	1,230	5,570	------	2,170	1,920	2,080	2,070	2,020	2,970	2,440
13	------	1,230	1,230	8,730	17,070	2,060	1,890	2,000	2,130	------	2,470	1,890
14	1,630	1,230	1,230	------	11,570	2,380	------	1,860	1,600	5,130	2,300	1,890
15	2,490	1,230	1,230	55,230	8,730	2,580	1,880	1,770	------	3,980	2,230	2,070
16	2,130	1,230	1,230	38,230	7,770	------	1,840	1,730	1,780	2,770	3,540	1,990
17	1,630	1,230	1,230	17,630	7,480	3,000	1,740	1,720	1,620	2,550	3,010	2,260
18	1,630	1,230	1,230	13,530	6,700	2,360	1,760	------	1,530	2,350	2,520	2,220
19	2,480	1,230	1,230	12,030	------	2,240	1,760	1,990	1,580	2,200	2,800	2,350
20	------	1,230	1,230	12,930	6,290	2,180	1,690	1,900	1,580	------	2,600	2,280
21	1,460	1,230	1,230	------	5,630	2,180	------	1,760	1,630	2,110	3,970	2,270
22	1,480	1,230	1,230	16,530	5,330	2,150	1,490	1,580	------	1,950	3,060	3,470
23	1,480	1,230	1,230	16,530	5,030	------	1,350	1,590	1,970	1,880	2,340	9,420
24	1,580	------	------	16,530	4,230	2,320	1,350	1,700	2,130	1,830	2,780	5,860
25	1,380	1,230	1,230	14,930	4,230	2,330	1,400	------	2,240	1,880	2,770	4,500
26	1,380	1,230	1,230	14,930	------	2,320	1,350	2,000	2,370	1,880	2,640	3,250
27	------	1,230	1,230	13,730	3,600	2,330	1,350	1,880	2,960	------	15,650	8,460
28	1,460	1,230	1,230	------	8,730	2,500	------	1,770	2,910	1,890	7,870	12,420
29	1,330	------	1,230	12,930	7,730	2,710	1,750	1,860	------	1,740	5,760	6,970
30	1,450	------	1,230	10,730	6,530	------	1,600	1,890	4,790	1,690	5,470	4,030
31	1,380	------	------	------	5,330	------	1,580	1,770	------	1,640	------	12,640
Mean	1,800	1,250	1,230	12,000	7,628	2,873	1,775	1,819	1,989	2,539	3,566	4,180

1896.

1	21,540	1,650	10,630	3,660	12,140	4,530	1,820	1,820	1,620	1,950	1,970	3,240
2	5,470	1,850	39,010	4,050	11,440	4,000	1,840	1,690	1,470	1,910	2,110	1,850
3	5,220	1,690	16,680	4,300	11,380	2,300	1,840	1,970	1,390	1,910	2,040	1,710
4	3,460	1,640	6,510	3,720	11,540	2,270	1,740	1,680	1,480	2,230	1,970	1,700
5	2,110	1,620	4,580	3,390	11,070	3,080	1,680	1,630	1,490	1,890	2,140	2,310
6	2,020	1,810	4,120	3,370	12,180	3,110	1,500	1,970	1,570	1,740	8,100	3,040
7	2,100	1,840	4,440	3,280	11,460	3,530	2,310	2,100	4,760	1,610	6,480	2,470
8	2,320	1,860	4,430	3,360	10,340	3,570	2,080	2,310	2,830	1,540	4,830	2,220
9	2,310	1,770	4,030	3,180	10,200	4,500	2,490	1,970	2,170	1,460	3,610	2,210
10	2,310	1,530	3,340	3,420	10,020	5,760	2,390	1,980	1,520	1,530	3,250	2,340
11	2,320	1,560	3,230	3,900	10,000	5,230	2,140	1,760	2,000	1,700	3,040	2,060
12	2,240	1,620	3,070	4,800	10,860	4,710	1,810	1,660	1,930	1,590	3,320	1,910
13	2,190	1,720	3,000	6,770	9,490	4,020	1,800	1,620	1,830	1,590	3,720	1,930
14	2,230	1,560	2,780	12,310	8,310	3,980	1,960	1,660	1,750	1,600	3,320	2,210
15	2,160	1,730	2,810	14,880	7,690	3,620	1,770	1,710	1,640	1,590	2,740	1,630
16	2,030	1,880	2,600	23,180	7,110	3,260	1,940	2,240	1,420	1,730	2,690	1,620
17	2,040	1,840	2,630	27,390	5,910	3,190	1,960	2,230	1,560	1,660	2,490	1,130
18	2,090	1,920	2,310	25,020	5,470	2,700	1,980	2,450	1,730	1,380	2,460	1,680
19	2,180	1,910	2,310	23,660	5,220	2,650	2,050	2,270	1,740	1,810	2,300	1,820
20	2,190	1,920	2,780	24,550	4,860	2,530	1,890	2,050	1,820	2,180	2,370	1,940
21	2,180	1,800	5,570	25,340	4,760	2,040	2,300	2,260	2,450	2,100	1,690	2,190
22	1,860	1,940	4,680	22,450	4,550	2,220	2,760	1,900	2,390	5,710	1,990	2,150
23	1,930	1,730	4,050	19,550	4,080	2,530	2,190	2,300	2,360	3,720	1,750	2,080
24	1,840	1,440	3,690	18,090	3,970	2,250	2,080	2,190	2,130	3,160	2,280	1,920
25	1,790	1,650	3,270	16,240	3,680	2,100	2,190	1,960	2,180	3,280	2,390	2,040
26	1,540	1,620	3,220	15,500	3,940	1,850	1,680	1,680	1,960	2,450	2,360	1,950
27	1,750	1,600	3,540	14,360	3,870	1,990	2,100	1,660	1,830	2,260	2,380	1,640
28	1,830	1,680	3,830	13,720	4,370	2,130	1,940	1,690	1,810	2,060	2,820	1,580
29	1,680	1,810	4,430	13,170	4,310	1,630	2,040	1,870	1,440	1,960	5,670	1,650
30	1,600	------	3,610	12,750	4,610	1,770	2,030	1,600	1,500	1,900	3,580	1,990
31	1,870	------	3,560	------	4,660	------	1,750	1,570	------	2,030	------	2,030
Mean	2,916	1,731	5,443	12,444	7,532	3,102	2,002	1,918	1,926	2,104	3,062	2,008

Daily discharge, in second-feet, of Androscoggin River, etc.—Continued.

1897.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,062	1,787	1,816	2,043	16,440	8,023	5,943	5,726	1,291	1,596	1,085	2,180
2	1,851	1,806	1,645	2,290	15,312	7,641	4,956	4,829	1,383	1,455	1,443	1,846
3	1,812	1,766	1,618	2,871	17,981	6,787	3,941	4,428	1,217	1,800	5,686	1,921
4	1,820	1,793	1,554	2,634	19,266	7,235	3,231	3,423	1,234	1,435	3,617	1,877
5	2,257	1,636	1,694	1,914	14,649	7,952	3,271	3,013	1,143	1,328	2,450	2,609
6	4,623	1,653	1,661	2,377	12,818	8,200	3,282	2,798	1,249	1,413	1,780	3,450
7	2,729	1,623	1,652	4,639	11,576	7,379	3,304	2,289	1,298	1,359	1,506	2,784
8	2,022	1,911	1,637	5,573	10,739	7,331	3,483	2,086	1,146	1,441	1,776	2,368
9	1,753	2,228	1,660	4,580	10,104	6,687	3,197	2,240	1,355	1,297	1,820	2,350
10	1,612	2,016	1,673	3,768	11,178	10,523	3,260	2,271	1,375	1,360	2,410	2,357
11	1,814	1,817	1,707	3,891	11,528	14,764	3,011	2,061	1,765	1,414	2,353	2,232
12	1,787	1,635	1,748	3,633	10,359	10,817	2,727	1,993	1,873	1,360	2,090	2,905
13	1,589	1,679	1,814	4,199	11,447	8,982	5,660	1,924	1,596	3,757	1,992	2,382
14	1,574	1,799	1,917	4,737	19,220	10,500	17,505	1,669	1,695	2,363	1,663	2,926
15	1,644	1,644	1,570	5,181	15,333	10,118	22,906	1,385	1,691	1,894	1,653	3,302
16	1,680	1,755	1,688	8,221	11,690	8,414	12,781	2,390	1,543	1,606	1,610	7,462
17	1,706	1,790	1,568	11,435	10,709	7,763	10,015	3,672	1,649	1,610	2,620	5,699
18	1,661	1,694	1,587	9,546	10,469	7,068	8,800	2,828	1,764	1,873	2,717	4,221
19	1,742	1,777	1,732	9,746	9,565	6,303	8,121	2,255	1,395	1,480	2,607	1,965
20	1,320	1,597	1,829	10,736	9,230	5,841	7,380	2,103	1,448	1,619	1,259	1,622
21	1,552	1,055	1,712	7,802	8,771	5,839	6,786	1,994	1,867	1,683	1,223	2,051
22	1,545	1,150	1,688	6,415	8,338	4,917	6,709	1,420	1,961	1,491	1,665	2,129
23	1,680	1,571	2,102	8,230	6,724	4,098	7,657	1,452	1,776	1,544	1,373	2,241
24	1,709	1,604	2,516	11,880	7,338	2,634	6,982	1,619	1,768	1,664	1,218	2,258
25	1,567	1,738	2,387	16,082	7,526	4,345	7,030	1,651	1,833	1,409	1,245	1,797
26	1,400	1,680	2,253	18,986	9,732	4,469	6,721	1,852	2,001	1,504	1,573	1,736
27	1,459	1,516	2,061	17,272	8,895	3,493	5,327	1,755	1,997	1,506	5,295	2,149
28	1,662	1,501	1,883	15,440	12,432	3,405	4,242	1,472	1,941	1,506	5,149	2,086
29	1,476	-------	1,791	15,912	11,383	3,420	4,016	1,368	1,891	1,489	3,039	1,894
30	1,541	-------	1,938	15,359	10,095	4,007	5,560	1,400	1,605	1,336	2,545	1,781
31	1,812	-------	1,995	-------	9,397	-------	6,940	1,342	-------	1,190	-------	1,886
Mean	1,821	1,686	1,810	7,913	11,621	6,998	6,605	2,345	1,592	1,606	2,282	2,596

1898.

1	2,142	1,823	1,641	8,582	9,925	5,001	2,067	1,601	1,421	2,080	2,508	2,507
2	1,905	1,584	1,601	7,370	9,963	4,643	2,280	1,858	1,493	2,149	2,514	2,519
3	1,815	1,822	1,565	6,772	9,422	4,384	2,192	1,912	1,713	1,961	2,500	2,556
4	1,938	1,949	1,615	6,221	8,941	4,743	2,152	1,588	2,638	1,871	2,463	2,448
5	1,909	2,193	1,573	5,693	8,086	4,462	2,209	2,025	2,151	2,151	2,286	2,290
6	1,953	1,960	1,470	5,262	9,414	4,352	2,132	2,459	1,815	2,122	2,233	2,233
7	2,095	1,741	1,397	4,977	8,591	4,298	2,010	1,974	1,707	2,288	2,155	2,443
8	2,130	1,635	1,462	4,833	8,423	4,694	2,003	1,890	1,776	2,408	2,150	2,196
9	2,118	1,655	1,817	4,962	7,669	6,200	1,960	1,805	1,801	2,038	2,265	2,115
10	2,048	1,606	1,859	5,639	6,746	6,139	1,721	1,639	1,742	1,949	2,203	2,030
11	1,974	1,602	2,147	6,710	6,426	4,669	1,645	1,635	1,440	1,800	2,341	1,910
12	1,858	1,728	2,606	8,243	7,264	4,790	1,808	1,560	1,302	1,889	2,856	1,796
13	1,953	2,109	3,583	10,102	15,566	5,243	1,710	1,495	1,484	1,929	2,715	1,829
14	2,185	1,778	6,894	10,933	13,245	5,662	1,728	1,487	1,509	1,772	2,807	1,940
15	2,041	1,724	7,501	11,849	11,295	7,980	1,736	1,577	1,457	1,803	2,614	2,022
16	2,113	1,758	6,052	12,349	11,882	6,475	1,677	1,567	1,524	2,466	2,569	2,016
17	1,887	1,443	5,055	11,623	11,763	5,964	1,710	1,465	1,595	2,273	2,460	2,007
18	1,854	1,224	4,983	13,272	11,196	5,587	1,463	1,562	1,352	2,415	2,731	2,053
19	1,751	1,577	4,987	11,594	10,996	5,025	1,673	1,583	1,789	2,075	3,720	2,382
20	1,977	1,673	5,195	10,268	10,594	6,596	2,031	2,033	1,893	2,269	6,903	2,107
21	1,927	1,574	9,617	8,504	10,386	5,844	2,194	1,448	1,842	2,600	4,754	1,992
22	1,977	1,577	8,231	7,899	9,216	5,384	2,013	1,517	1,667	2,588	3,698	2,215
23	1,778	1,545	7,365	9,075	9,000	4,914	1,969	1,616	1,555	4,039	3,165	2,319
24	1,764	1,608	8,041	10,057	8,377	3,888	1,526	1,557	2,433	2,312	2,923	2,454
25	1,878	1,549	7,826	16,748	8,666	3,095	1,684	1,590	4,245	2,742	2,816	2,580
26	1,936	1,640	7,442	15,881	7,281	2,837	1,930	1,888	3,534	2,662	2,011	2,290
27	2,038	1,764	7,631	13,083	6,033	2,672	2,261	1,981	2,610	11,529	1,971	2,260
28	1,928	1,763	8,032	11,292	7,243	2,508	1,904	1,744	2,456	6,698	1,840	2,201
29	1,918	-------	9,585	10,266	5,650	2,116	1,599	1,668	2,399	4,585	1,741	1,939
30	1,832	-------	10,096	9,217	5,459	2,117	1,569	1,501	2,077	3,228	2,486	2,047
31	1,764	-------	10,857	-------	5,085	-------	1,812	1,595	-------	2,776	-------	2,176
Mean	1,947	1,700	5,152	9,309	9,026	4,743	1,883	1,703	1,947	2,821	2,746	2,189

Daily discharge, in second-feet, of Androscoggin River, etc.—Continued.

1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,398	1,832	1,926	2,029	24,057	3,773	3,224	1,521	1,359	2,130	2,186	1,230
2	2,441	1,861	1,955	2,088	24,077	3,495	3,600	1,557	1,453	1,784	3,172	1,247
3	1,933	1,736	1,877	1,998	21,468	3,383	2,800	1,492	1,247	1,709	2,865	1,700
4	2,124	1,825	1,791	1,974	19,480	3,400	1,700	1,601	1,455	1,532	2,232	1,792
5	2,255	1,810	1,738	2,024	16,631	3,042	1,510	1,758	1,466	1,566	2,030	1,289
6	2,613	1,789	1,780	2,009	15,111	2,988	1,485	1,717	1,469	1,454	1,925	1,170
7	2,675	1,768	1,978	2,129	14,368	3,574	1,718	1,636	1,434	1,527	2,060	1,290
8	2,275	1,773	2,017	2,436	14,358	3,625	1,823	1,325	1,332	1,330	1,899	1,018
9	2,267	1,619	1,801	2,460	13,970	3,264	1,900	1,442	1,328	1,368	1,843	1,016
10	1,192	1,606	1,712	2,688	12,874	3,295	1,779	1,274	1,141	1,400	1,778	1,010
11	2,074	1,462	1,706	2,954	12,035	3,761	1,934	1,335	1,281	1,482	1,674	1,084
12	1,931	1,812	1,754	3,174	11,182	3,150	1,589	1,357	1,357	1,351	1,230	1,253
13	2,316	1,814	1,646	2,975	10,721	2,984	2,366	1,317	1,319	1,231	1,170	5,274
14	2,059	1,957	2,037	3,054	10,054	3,012	1,818	1,261	1,368	1,452	1,171	3,354
15	2,084	1,981	2,007	4,236	9,122	2,797	1,494	1,209	1,529	1,230	1,516	1,965
16	2,127	1,929	1,913	6,808	7,630	3,494	1,651	1,250	1,274	1,234	1,476	1,626
17	2,135	1,919	1,846	6,490	7,134	3,524	1,270	1,221	1,243	1,413	1,561	1,183
18	2,137	1,920	1,843	7,457	5,960	3,230	1,232	1,326	1,300	1,432	1,343	1,331
19	2,325	1,886	1,834	9,509	5,340	3,186	1,563	1,455	1,470	1,405	1,300	1,781
20	1,924	1,824	1,826	11,127	5,706	3,079	1,173	1,453	1,524	2,096	1,489	1,795
21	1,848	1,899	1,819	11,543	6,497	3,024	1,271	1,349	1,788	1,744	1,860	2,051
22	1,835	1,960	1,823	12,461	6,028	3,529	2,433	1,331	2,043	1,500	1,914	1,929
23	2,093	2,029	1,818	14,599	5,369	3,198	3,682	1,676	2,202	1,368	1,866	1,805
24	2,058	2,111	1,816	17,372	4,821	3,049	1,927	1,462	1,794	1,347	1,825	1,412
25	2,003	1,928	1,818	17,371	4,443	3,060	1,634	1,571	1,124	1,455	1,628	1,298
26	2,106	1,819	1,862	20,017	4,328	2,793	1,490	1,557	1,381	1,443	1,500	1,689
27	1,944	1,816	1,763	23,287	4,019	3,127	1,443	1,265	2,971	1,637	1,370	1,343
28	2,008	1,931	1,831	20,787	4,151	2,717	1,233	1,329	2,397	1,511	1,571	1,278
29	1,697	-------	1,839	21,319	4,465	3,297	1,142	1,382	2,223	2,767	1,382	1,097
30	1,760	-------	1,948	22,920	4,290	3,282	1,170	1,464	2,124	2,548	1,224	1,048
31	1,721	-------	1,976	-------	3,849	-------	1,267	1,372	-------	2,220	-------	1,437
Mean	2,111	1,843	1,848	8,709	10,114	3,238	1,817	1,428	1,580	1,604	1,733	1,606

1900.

1	1,231	1,351	3,063	1,830	16,182	5,582	1,780	1,611	1,650	1,985	1,530	3,264
2	1,170	1,295	2,849	1,933	13,249	5,952	1,781	1,560	1,600	1,856	1,466	3,250
3	1,171	1,346	2,791	2,026	12,008	6,850	1,705	1,504	1,650	1,987	1,504	3,059
4	1,190	1,869	2,190	2,561	17,092	7,458	1,640	1,512	1,682	2,137	1,460	3,192
5	1,198	1,362	2,434	2,734	13,700	7,016	1,760	1,500	1,672	2,062	1,479	2,088
6	1,258	1,277	2,136	2,791	10,555	6,196	1,744	1,486	1,603	2,056	1,466	2,173
7	1,224	1,334	2,047	2,592	10,165	6,341	1,791	1,490	1,482	2,079	1,547	2,375
8	1,289	1,354	1,794	4,730	9,121	5,627	1,800	1,505	1,299	2,010	1,694	2,833
9	1,189	1,438	1,810	4,603	8,283	5,550	1,803	1,685	1,264	2,053	10,131	2,030
10	1,115	1,420	1,826	3,836	9,468	4,948	1,798	1,722	1,275	2,006	12,061	1,939
11	1,130	1,654	1,801	3,318	8,024	4,850	1,719	1,620	1,247	2,703	7,525	1,983
12	1,135	1,467	1,768	3,989	7,038	4,509	1,777	1,630	1,273	3,754	5,230	2,339
13	1,211	1,777	1,749	4,138	6,720	4,609	1,781	1,592	1,390	3,197	4,436	2,571
14	1,139	6,009	1,600	4,099	7,734	4,263	1,949	1,648	1,352	2,731	3,870	2,329
15	1,178	5,570	1,772	4,943	10,917	4,113	2,000	1,811	1,332	3,472	3,636	2,470
16	1,147	4,151	1,620	6,230	13,415	4,487	1,880	1,942	1,389	3,615	3,610	2,650
17	1,251	3,599	1,901	8,171	12,062	4,439	2,561	2,009	1,478	3,033	3,104	2,003
18	1,196	2,972	2,549	9,220	13,877	3,015	2,992	1,918	1,667	3,007	3,330	2,071
19	1,181	2,954	2,425	16,130	18,383	2,956	3,168	1,703	1,660	3,255	3,330	2,114
20	1,241	2,562	2,179	22,025	24,531	3,384	3,042	1,714	1,656	2,042	3,893	2,357
21	2,195	2,408	2,491	21,980	22,126	3,311	2,850	1,522	1,658	1,930	6,398	2,215
22	3,221	2,306	2,729	21,317	19,930	2,955	2,885	1,462	1,913	1,509	6,794	2,042
23	2,169	2,146	2,647	21,593	17,632	2,037	2,834	1,437	1,860	1,754	5,819	2,265
24	1,879	2,002	2,255	21,837	16,391	1,948	2,779	1,459	1,860	1,765	4,681	1,764
25	1,765	2,326	1,894	20,250	14,778	1,893	2,844	1,391	1,712	1,676	3,500	2,420
26	1,698	5,157	1,930	17,679	13,408	1,855	2,828	1,318	1,745	1,618	2,934	2,622
27	1,628	4,626	1,819	15,739	12,295	1,855	2,727	1,382	1,697	1,430	3,374	2,300
28	1,382	3,814	1,776	13,458	9,687	1,810	2,530	1,387	2,025	1,430	3,112	1,871
29	1,215	-------	1,836	12,877	9,250	1,931	2,020	1,369	1,930	1,492	2,624	1,983
30	1,285	-------	1,788	13,274	6,973	2,070	1,782	1,413	1,860	1,482	2,834	1,831
31	1,350	-------	1,919	-------	6,632	-------	1,686	1,503	-------	1,500	-------	1,865
Mean	1,408	2,555	2,109	9,763	12,633	4,127	2,201	1,574	1,596	2,213	3,945	2,331

Daily discharge, in second-feet, of Androscoggin River, etc.—Continued.

1901.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,872	1,827	1,940	2,887	16,128	6,712	3,355	3,053	1,812	1,696	1,741	1,525
2	1,757	1,826	1,926	3,200	15,173	6,453	3,192	3,024	1,852	1,715	1,605	1,427
3	1,692	1,837	1,934	3,882	14,297	7,223	3,584	2,899	1,721	1,671	1,563	1,503
4	1,872	1,683	2,081	6,303	13,977	7,424	3,670	2,525	1,624	1,725	1,499	1,403
5	1,811	1,641	2,124	8,823	12,634	6,725	3,099	2,941	1,671	1,670	1,600	1,209
6	1,901	1,644	2,087	8,328	11,614	6,051	2,681	2,490	1,643	1,547	1,677	1,340
7	1,890	1,595	2,061	13,694	10,610	5,634	2,850	3,547	1,418	1,768	1,666	1,307
8	2,015	1,563	2,094	17,062	9,472	6,916	3,209	5,035	1,447	2,031	1,649	1,383
9	1,974	1,653	2,191	17,115	8,608	5,909	3,500	4,615	1,518	2,021	1,589	1,390
10	1,908	1,660	2,223	15,115	8,503	5,766	3,432	2,997	1,374	2,060	1,588	1,609
11	1,856	1,764	2,055	15,956	16,044	5,510	3,116	3,377	1,449	1,982	1,576	2,021
12	1,896	2,496	2,070	14,911	16,507	4,598	3,445	3,189	1,609	1,641	1,767	2,087
13	1,935	2,054	2,113	12,811	12,362	3,755	3,120	2,927	1,631	1,705	1,787	1,989
14	1,938	1,949	2,011	12,831	12,068	3,680	1,992	2,802	1,537	3,536	1,829	2,616
15	1,896	1,765	1,961	14,285	10,868	3,450	1,739	2,693	1,442	5,137	1,814	27,785
16	1,956	1,868	1,889	13,694	9,871	3,206	1,784	3,244	1,764	3,818	1,748	22,578
17	2,082	1,885	1,934	13,580	8,854	3,271	2,039	3,135	1,742	2,911	1,640	6,243
18	2,026	1,912	1,943	15,139	8,054	3,040	2,842	2,116	1,666	2,860	1,702	3,515
19	1,833	1,985	1,938	15,181	10,924	2,926	2,833	2,118	1,611	2,859	1,700	2,865
20	1,895	1,969	1,873	14,576	16,808	2,992	2,675	2,453	1,440	2,689	1,692	2,597
21	1,907	1,875	1,980	19,219	11,722	3,584	2,428	2,782	1,521	2,866	1,592	2,473
22	2,002	1,842	2,861	32,653	9,310	3,227	2,054	2,750	1,416	2,640	1,636	2,310
23	1,925	1,855	3,407	30,619	8,186	3,227	1,824	2,682	1,955	2,222	1,637	2,298
24	1,881	1,853	3,046	23,886	7,578	3,297	1,864	2,498	1,787	1,749	1,532	2,518
25	1,917	1,822	2,865	19,065	8,046	3,419	1,822	2,499	1,535	1,803	1,543	2,436
26	1,886	1,776	3,114	18,371	6,711	3,100	1,759	2,443	1,682	1,736	1,425	2,506
27	1,898	1,848	3,720	16,162	6,285	2,831	1,612	2,287	1,343	1,728	1,361	2,528
28	1,858	1,856	4,445	16,062	7,500	2,787	1,844	2,166	1,361	1,770	1,233	2,948
29	1,835	------	3,845	15,198	8,464	2,868	2,239	2,114	1,489	1,873	1,205	2,643
30	1,823	------	3,378	16,120	7,910	3,033	3,381	2,090	1,652	1,755	1,590	2,761
31	1,800	------	3,234	------	7,248	------	3,833	1,925	------	1,753	------	2,813
Mean	1,895	1,832	2,463	14,891	10,714	4,420	2,671	2,820	1,590	2,224	1,606	3,764

The monthly discharge of the river at Rumford Falls from 1892 to 1901 is given in the following tables, also the rainfall and run-off for the same years. The precipitation given is from records at two stations, viz, West Milan, N. H., and Rumford Falls, Me. The precipitation for 1892 and 1893 is from records at the former station; the records for 1894, 1895, 1896, and 1897 are means of the records taken at the two stations, while the precipitation for 1898 and succeeding years is from records at Rumford Falls.

Estimated monthly discharge of Androscoggin River at Rumford Falls, Me.

[Drainage area, 2,320 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1892.						
May 18 to 31	11,700	4,940	7,660	3.30	[a]1.72	3.19
June	19,900	3,830	7,410	3.19	3.56	8.74
July	17,500	2,820	7,730	3.33	3.84	3.66
August	8,500	2,600	4,840	2.09	2.41	8.38
September	5,860	2,580	4,030	1.74	1.94	2.74
October	2,940	2,700	2,780	1.20	1.38	1.88
November	24,500	2,330	5,720	2.47	2.75	4.91
December	3,830	2,820	3,200	1.38	1.59	1.55
1893.						
January	3,830	2,940	3,180	1.37	1.58	1.86
February	2,990	2,990	2,990	1.29	1.34	4.78
March	4,130	2,750	3,190	1.38	1.59	2.89
April	8,050	2,750	5,030	2.17	2.42	2.70
May	38,060	5,110	17,290	7.45	8.59	3.30
June	9,700	3,160	5,720	2.47	2.75	3.12
July	3,630	2,120	2,870	1.24	1.43	2.36
August	12,300	1,600	3,300	1.42	1.64	4.46
September	3,760	2,150	2,690	1.16	1.29	2.67
October	13,000	2,260	3,930	1.69	1.95	3.27
November	4,830	1,900	3,030	1.31	1.46	1.80
December	3,820	1,900	2,630	1.13	1.30	3.05
The year	38,060	1,600	4,654	2.01	27.34	36.26

[a] Partial month.

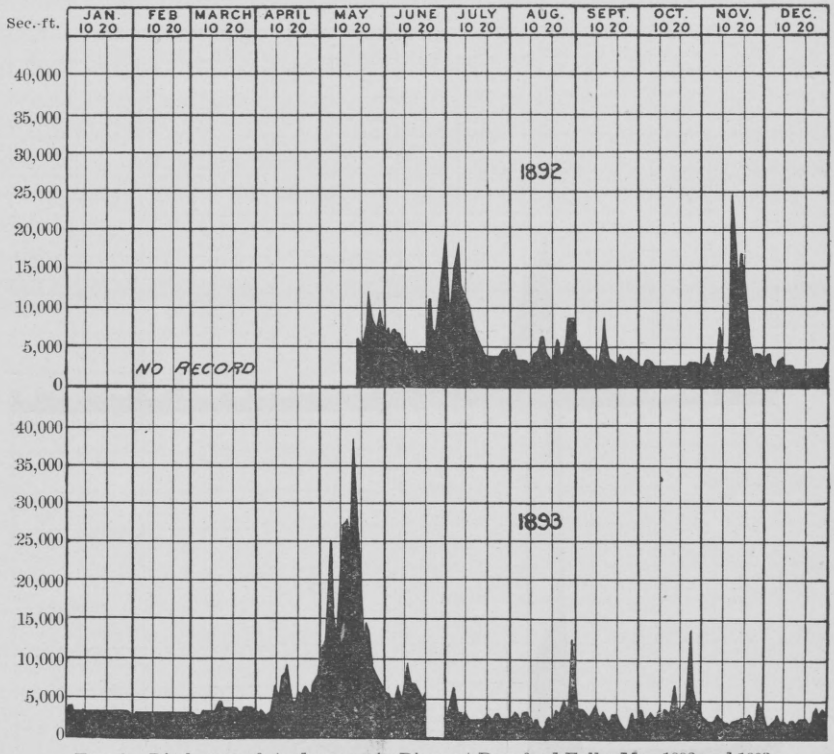


FIG. 8.—Discharge of Androscoggin River at Rumford Falls, Me., 1892 and 1893.

Estimated monthly discharge of Androscoggin River at Rumford Falls, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1894.						
January	3,570	2,130	2,720	1.17	1.35	2.87
February	2,310	1,570	1,950	0.84	0.87	3.40
March	7,090	1,570	4,030	1.74	1.94	1.94
April	22,230	3,300	9,470	4.08	4.55	1.62
May	19,230	4,550	8,240	3.55	4.10	4.46
June	9,830	3,100	5,100	2.20	2.45	3.89
July	5,310	1,680	2,510	1.08	1.25	4.31
August	2,480	1,380	1,930	0.83	0.96	3.11
September	5,880	1,630	2,230	0.96	1.07	3.61
October	5,580	1,460	2,500	1.08	1.25	3.24
November	7,380	1,380	3,040	1.31	1.46	3.85
December	2,890	1,460	2,090	0.90	1.04	3.18
The year	22,230	1,380	3,818	1.65	22.29	39.48
1895.						
January	2,530	1,330	1,800	0.78	0.90	3.21
February	1,460	1,230	1,250	0.54	0.56	1.01
March	1,230	1,230	1,230	0.53	0.61	1.27
April	55,230	1,230	12,000	5.17	5.77	4.73
May	17,070	3,600	7,628	3.29	3.80	4.08
June	5,030	2,060	2 873	1.24	1.38	3.15
July	2,300	1,350	1,775	0.77	0.89	2.49
August	2,080	1,580	1,819	0.78	0.90	3.38
September	4,790	1,400	1,989	0.86	0.96	2.01
October	6,380	1,640	2,539	1.16	1.34	1.58
November	15,650	1,730	3,566	1.54	1.72	5.52
December	12,640	1,890	4,180	1.80	2.08	4.84
The year	55,230	1,230	3,554	1.54	20.91	37.27

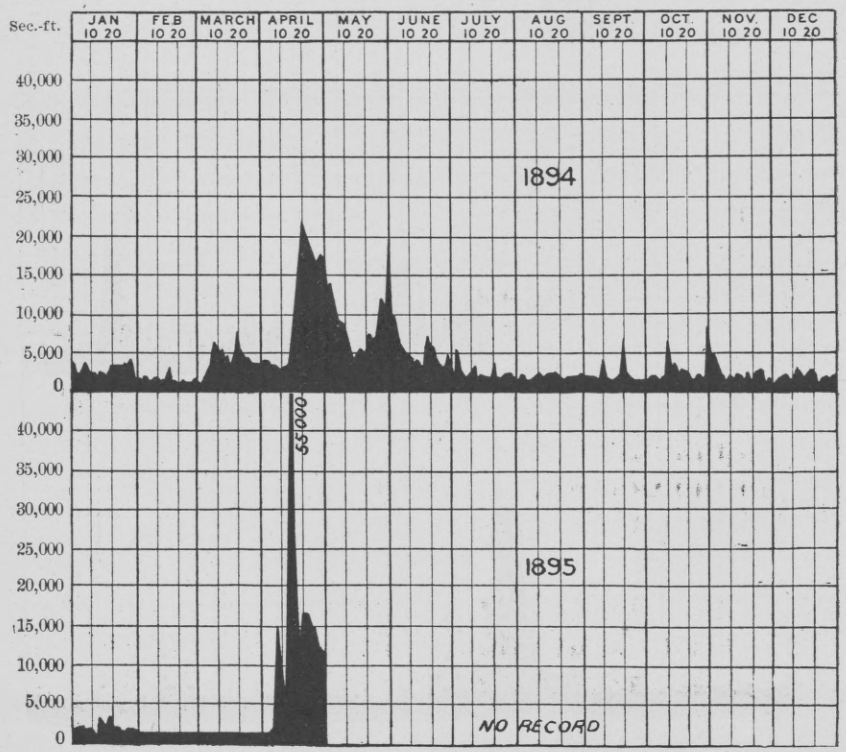


FIG. 9.—Discharge of Androscoggin River at Rumford Falls, Me., 1894 and 1895.

Estimated monthly discharge of Androscoggin River at Rumford Falls, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1896.						
January	21,540	1,540	2,916	1.26	1.45	1.70
February	1,940	1,440	1,731	0.75	0.81	5.34
March	39,010	2,310	5,443	2.35	2.71	8.56
April	27,390	3,180	12,444	5.36	5.98	2.16
May	12,180	3,680	7,532	3.25	3.75	2.15
June	5,760	1,630	3,102	1.34	1.50	1.75
July	2,760	1,500	2,002	0.86	0.99	3.54
August	2,450	1,570	1,918	0.83	0.96	3.33
September	4,760	1,390	1,926	0.83	0.93	4.07
October	5,710	1,380	2,104	0.91	1.05	2.91
November	8,100	1,690	3,062	1.32	1.47	3.16
December	3,240	1,130	2,008	0.87	1.00	1.16
The year	39,010	1,130	3,849	1.66	22.60	39.83
1897						
January	4,623	1,320	1,821	0.78	0.90	3.37
February	2,228	1,055	1,686	0.73	0.76	2.45
March	2,516	1,554	1,810	0.78	0.90	3.81
April	18,986	1,914	7,913	3.41	3.80	3.15
May	19,266	6,724	11,621	5.01	5.78	4.43
June	14,764	3,405	6,998	3.02	3.37	6.58
July	22,906	2,727	6,605	2.85	3.29	7.50
August	5,726	1,342	2,345	1.01	1.16	2.30
September	2,001	1,143	1,592	0.69	0.77	2.16
October	3,757	1,190	1,606	0.69	0.80	0.92
November	5,686	1,085	2,282	0.98	1.09	5.43
December	7,462	1,622	2,596	1.12	1.29	3.26
The year	22,906	1,055	4,073	1.76	23.91	45.36
1898.						
January	2,185	1,751	1,947	0.84	0.97	3.85
February	2,193	1,224	1,700	0.73	0.76	7.25
March	10,857	1,397	5,152	2.22	2.56	1.08
April	16,748	4,833	9,309	4.01	4.47	2.87
May	15,566	5,085	9,026	3.89	4.49	2.55
June	7,980	2,116	4,743	2.04	2.27	3.05
July	2,280	1,463	1,883	0.81	0.93	2.70
August	2,459	1,448	1,703	0.73	0.84	3.39
September	4,245	1,302	1,947	0.84	0.94	3.96
October	11,529	1,772	2,821	1.22	1.41	4.52
November	6,903	1,741	2,746	1.18	1.32	5.00
December	2,580	1,796	2,189	0.94	1.08	1.95
The year	16,748	1,224	3,764	4.62	22.04	42.17

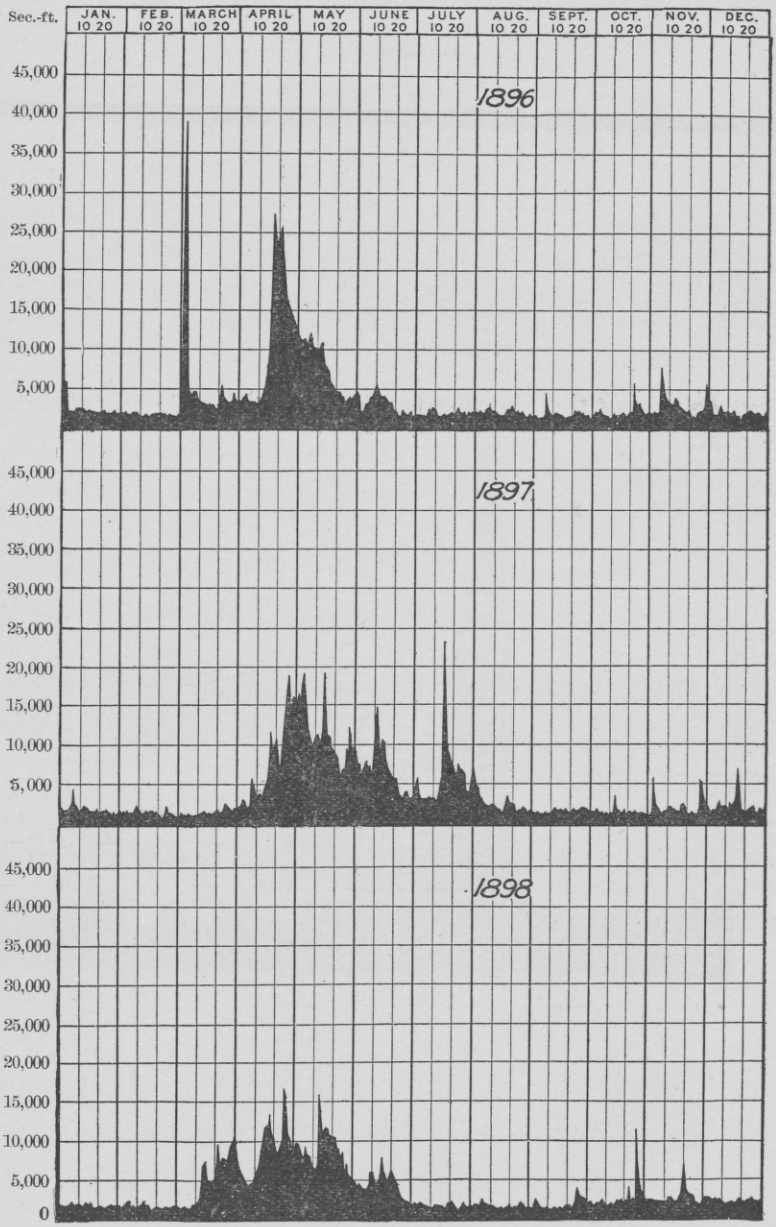


FIG. 10.—Discharge of Androscoggin River at Rumford Falls, Me., 1896 to 1898.

Estimated monthly discharge of Androscoggin River at Rumford Falls, Me.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1899.						
January	2,675	1,697	2,111	0.91	1.05	3.18
February	2,111	1,462	1,843	0.79	0.82	2.56
March	2,037	1,646	1,848	0.80	0.92	5.89
April	23,287	1,974	8,709	3.75	4.18	1.50
May	24,077	3,849	10,114	4.36	5.03	1.89
June	3,773	2,717	3,238	1.40	1.56	2.27
July	3,682	1,142	1,817	0.78	0.90	4.71
August	1,758	1,209	1,428	0.62	0.71	0.64
September	2,971	1,124	1,580	0.68	0.76	3.00
October	2,767	1,230	1,604	0.69	0.80	2.05
November	3,172	1,170	1,733	0.75	0.84	1.94
December	5,274	1,010	1,606	0.69	0.80	1.95
The year	24,077	1,010	3,136	1.35	18.37	31.58

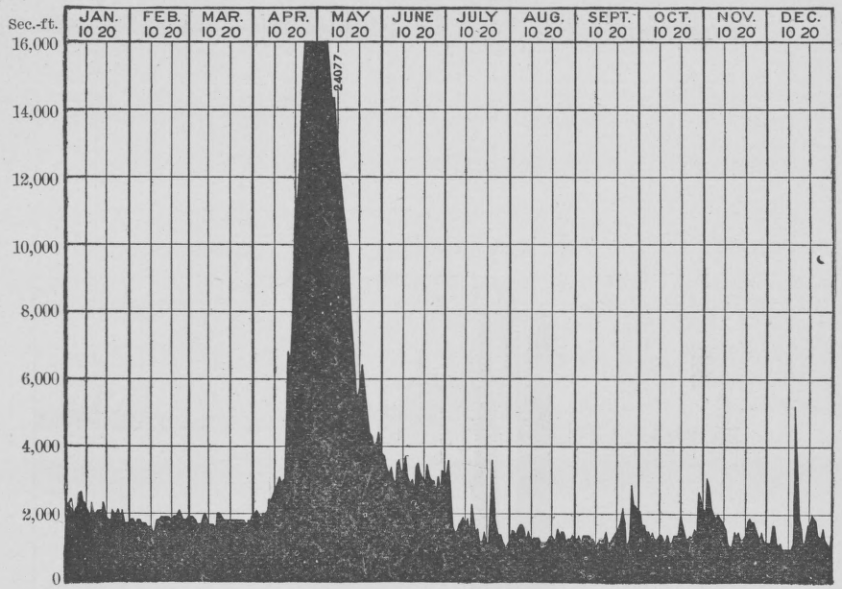


FIG. 11.—Discharge of Androscoggin River at Rumford Falls, Me., 1899.

Estimated monthly discharge of Androscoggin River at Rumford Falls, Me.—Continued

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1900.						
January	3,221	1,115	1,408	0.61	0.70	5.80
February	6,009	1,277	2,555	1.10	1.15	7.96
March	3,063	1,600	2,109	0.91	1.05	5.82
April	22,025	1,830	9,763	4.21	4.69	1.21
May	24,531	6,632	12,633	5.45	6.28	4.57
June	7,458	1,810	4,127	1.78	1.99	3.35
July	3,168	1,640	2,201	0.95	1.10	4.35
August	2,009	1,318	1,574	0.68	0.78	2.42
September	2,025	1,247	1,596	0.69	0.77	2.31
October	3,754	1,430	2,213	0.95	1.10	3.91
November	12,061	1,460	3,945	1.70	1.90	7.22
December	3,264	1,764	2,331	1.00	1.15	1.15
The year	24,531	1,115	3,871	1.67	22.66	50.07
1901.						
January	2,082	1,692	1,895	0.82	0.95	2.77
February	2,496	1,563	1,832	0.79	0.82	0.74
March	4,445	1,873	2,463	1.06	1.22	4.05
April	32,653	2,887	14,891	6.42	7.16	7.91
May	16,808	6,285	10,714	4.62	5.33	6.54
June	7,424	2,787	4,420	1.91	2.13	3.84
July	3,833	1,612	2,671	1.15	1.33	4.91
August	5,035	1,925	2,820	1.22	1.41	3.47
September	1,955	1,343	1,590	0.69	0.77	2.59
October	5,137	1,547	2,224	0.96	1.11	3.48
November	1,829	1,205	1,606	0.69	0.77	1.76
December	27,785	1,209	3,764	1.62	1.87	5.53
The year	32,653	1,205	4,241	1.83	24.87	47.59

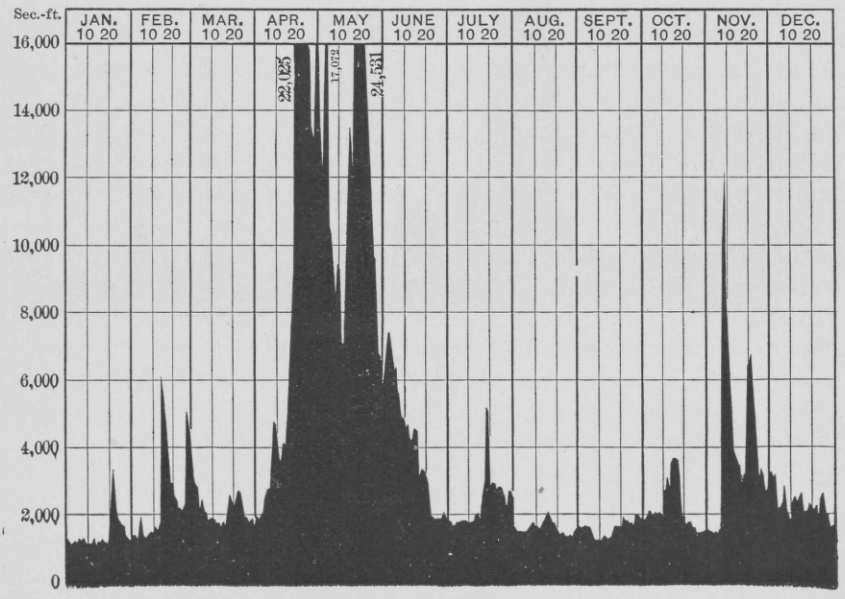


FIG. 12.—Discharge of Androscoggin River at Rumford Falls, Me., 1900.

Run-off, in second-feet per square mile, of Androscoggin River at Rumford Falls, Me.

[Drainage area, 2,320 square miles.]

Month.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Average.
January	.....	1.37	1.17	0.78	1.26	0.78	0.84	0.91	0.61	0.82	0.95
February	.....	1.29	0.84	0.54	0.75	0.73	0.73	0.79	1.10	0.79	0.84
March	.....	1.38	1.74	0.53	2.35	0.78	2.22	0.80	0.91	1.06	1.31
April	.....	2.17	4.08	5.17	5.36	3.41	4.01	3.75	4.21	6.42	4.29
May	3.30	7.45	3.55	3.29	3.25	5.01	3.89	4.36	5.45	4.62	4.42
June	3.19	2.47	2.20	1.24	1.34	3.02	2.04	1.40	1.78	1.91	2.06
July	3.33	1.24	1.08	0.77	0.86	2.85	0.81	0.78	0.95	1.15	1.38
August	2.09	1.42	0.83	0.78	0.83	1.01	0.73	0.62	0.68	1.22	1.02
September	1.74	1.16	0.96	0.86	0.83	0.69	0.84	0.68	0.69	0.69	0.91
October	1.20	1.69	1.08	1.16	0.91	0.69	1.22	0.69	0.95	0.96	1.05
November	2.47	1.31	1.31	1.54	1.32	0.98	1.18	0.75	1.70	0.69	1.33
December	1.38	1.13	0.90	1.80	0.87	1.12	0.94	0.69	1.00	1.62	1.14
The year	.....	2.01	1.65	1.54	1.66	1.76	1.62	1.35	1.67	1.83	1.70

LITTLE ANDROSCOGGIN RIVER.

Little Androscoggin River enters the main stream at Auburn. Rising in Oxford County, it has a total length of 30 miles and a drainage basin of 380 square miles. In this area there are 21 small ponds, with an aggregate area of about 22 square miles. Dams have been constructed at the outlets of a number of these ponds, so that the flow of the stream is rather constant, making it particularly valuable for water-power development. In the first three-fourths of a mile above its mouth the river has a fall of 70 feet. At the two dams nearest its mouth the power is owned by the Little Androscoggin Water Power Company, and is leased to the users. At the lower dam are the Barker Woolen Mills, having 35 feet of fall, with 400 horsepower of wheels, and several small woodworking and other establishments, using in the aggregate about 250 horsepower. The fall at the upper dam is 26 feet, and the power is used by the Auburn and Lewiston Electric Light Company. The privilege is regarded as good for 300 horsepower at all times. The electric-light company also leases the power at the third dam, where it has installed two 310-horsepower turbines, which work under a fall of about 23 feet.

At Mechanic Falls, 10 miles above the mouth of the river, the Poland Paper Company uses 30 feet fall and has turbines rated at 1,200 horsepower, while at the succeeding privilege a dam was built in August, 1896, to develop power for the Mechanic Falls Electric Light and Power Company. Above this point there is but little power used.

PRESUMPSCOT RIVER.

This is one of the most interesting as well as one of the best water-power streams of its size in the United States. It is the outlet of Sebago Lake, which lies about 17 miles northwest of Portland. (See Pl. X.) The lake is fed by Crooked River, a stream heading 35 miles farther north and within 3 miles of the Androscoggin. The area of

the lake is 50 square miles, the area of its drainage basin at the outlet of the lake 470 square miles, and the total drainage area of the river at its mouth 700 square miles. The northern part of the basin is mountainous and wooded, while the southern part is moderately hilly and cleared of trees. Granite, gneiss, and mica-schists appear at many points, and the soil is gravelly and sandy.

According to the survey made by Mr. Joseph A. Warren, of Cumberland Mills, the fall from the crest of the stone dam at the foot of Sebago Lake to mean low tide at the foot of the lower falls is 265.16 feet in a distance of 21.65 miles, or an average of 12.25 feet a mile. In the lower two-thirds of this distance, or from Gambo Falls to tide water, nearly seven-eighths of the whole fall, or 132 feet, has been improved, and an aggregate probably exceeding 6,000 net horsepower is in use. The remainder of the fall, however, between Gambo Falls and Sebago Lake, amounting to 133 feet, is either unimproved or but slightly utilized. At Great Falls, in this stretch, there is a descent of 22 feet, which has been used in the past but is now idle. It is proposed, however, to employ the power in the generation of electricity for delivery in Portland.

By far the largest users of power on the river are Messrs. S. D. Warren & Company, paper manufacturers, at whose plant at Cumberland Mills about 3,000 horsepower is used from all sources. Of this, 1,500 horsepower is from water direct, a fall of 20 feet being utilized, and the remainder is from steam and electricity, the latter being transmitted from the lower falls, 6 miles downstream, where there is a dam giving a fall, varying with the tide, of from 11 to 21 feet.

The next power above Cumberland Mills is at Saccarappa, where there are two dams giving falls of 19 and 12 feet, respectively. Here are the cotton mills of the Westbrook Manufacturing Company and the Dana Warp Company, the power house of the Westbrook Electric Light and Power Company, and several other smaller mills, the total water power used by all the establishments when in full operation being about 1,900 horsepower. At Mallison Falls about 300 horsepower, under a head of 20 feet, is used at the woolen mill of the Robinson Manufacturing Company, and at Little Falls 1,600 horsepower, with a head of 18 feet, is employed by the Sebago Wood Board Company.

The tributaries of Presumpscot River are not of much importance, but some of them are outlets of ponds and have considerable fall, thus affording constant though small power. Crooked River, the chief feeder of Sebago Lake, has a number of falls, some of which are utilized.

The chief interest attaching to the river is its regularity of flow, which is due to dams at the outlet of the lake. Nowhere in the United States is there a better example of the success of storage of

water and regulation of the flow of a stream than on the Presumpscot. Since January, 1887, the flow from Sebago Lake has been regularly recorded, the quantity being deduced from the openings in the gates at the dam, the discharging capacity of which under different conditions of head has been determined and tabulated by Mr. Hiram F. Mills, of Lowell. Since January, 1872, a continuous record of the level of the lake surface has been kept. An unusually complete and valuable series of data has thus been obtained, which has been furnished to the United States Geological Survey by Messrs. S. D. Warren & Company. The lake fills rapidly after the first of March, attaining its maximum height between the middle of April and the first of June, and then gradually subsides as water is withdrawn for mill purposes, until a minimum stage is reached, sometimes in the autumn, but usually in the winter. The following records of the daily discharge of the river at the outlet of the lake show the remarkable uniformity of flow, which, as already stated, is due largely to artificial regulation. There is no other river in the United States upon which so small variations occur throughout the year. On Sundays the gates are closed, so that only the waste is allowed to reach the river.

Daily discharge, in second-feet, of Presumpscot River at the outlet of Sebago Lake.

[Drainage area, 470 square miles.]

1887.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	933	933	933	933	(a)	1,000	933	837	933	933	933	933
2	(a)	933	933	933	933	1,000	933	837	933	(a)	933	933
3	933	933	933	(a)	933	1,000	(a)	837	933	933	933	933
4	933	933	933	933	933	1,000	933	837	(a)	933	933	(a)
5	933	933	933	933	933	1,000	933	837	933	933	933	933
6	933	(a)	(a)	933	933	1,000	933	837	933	933	(a)	933
7	933	933	933	933	933	1,000	896	(a)	933	933	933	933
8	933	933	933	933	(a)	1,000	896	837	933	933	933	933
9	(a)	933	933	933	933	1,000	896	837	933	(a)	933	933
10	933	933	933	(a)	933	1,000	(a)	837	933	933	933	933
11	933	933	850	933	933	1,000	896	974	(a)	933	933	(a)
12	933	933	850	933	1,000	1,000	896	974	933	933	933	933
13	933	(a)	(a)	933	1,000	1,000	896	974	933	933	(a)	933
14	860	933	850	933	1,000	1,000	933	(a)	933	933	933	933
15	860	933	950	933	1,000	1,000	933	974	933	933	933	964
16	(a)	933	850	933	1,000	1,000	933	974	933	(a)	933	964
17	860	933	850	(a)	1,000	1,000	(a)	974	933	933	933	964
18	860	933	1,003	933	1,000	1,000	933	974	(a)	933	933	(a)
19	860	933	1,003	933	1,000	1,000	933	862	933	933	933	964
20	860	(a)	(a)	933	1,000	1,000	933	862	933	933	(a)	934
21	860	933	933	933	1,000	1,000	878	(a)	933	933	933	964
22	860	933	933	933	1,000	1,000	878	862	933	933	933	964
23	(a)	933	933	933	1,000	908	878	862	933	(a)	933	964
24	860	933	933	(a)	1,000	908	(a)	862	933	933	933	964
25	860	933	933	933	1,000	908	878	933	(a)	933	933	(a)
26	860	933	933	933	1,000	(a)	878	933	933	933	933	964
27	933	(a)	(a)	933	1,000	908	878	933	933	933	(a)	964
28	933	933	933	933	1,000	908	837	(a)	933	933	933	964
29	933	-------	933	933	1,000	908	837	933	933	933	933	964
30	(a)	-------	933	933	1,000	933	837	933	933	(a)	933	964
31	933	-------	933	-------	1,000	-------	(a)	933	-------	933	-------	964
Mean	902	933	920	933	979	978	901	898	933	933	933	950

a Sunday; gates closed.

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1888.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(a)	964	919	(a)	933	1,667	(a)	852	825	818	695	933
2	964	857	919	866	933	1,667	933	850	(a)	818	695	(a)
3	964	857	919	866	933	1,667	933	850	825	818	695	933
4	964	857	(a)	866	933	1,667	933	850	825	811	(a)	933
5	974	(a)	919	866	933	1,667	933	(a)	825	811	695	933
6	974	857	919	866	(a)	1,667	933	850	825	811	695	933
7	974	857	919	866	933	1,000	933	850	825	(a)	695	933
8	(a)	857	919	(a)	933	1,000	(a)	850	825	811	833	933
9	974	857	919	866	933	1,000	933	840	(a)	811	833	(a)
10	974	857	919	866	933	1,000	933	840	825	717	833	933
11	974	857	(a)	866	933	1,000	933	840	825	717	(a)	933
12	974	(a)	919	933	933	1,000	869	(a)	933	717	833	933
13	974	857	919	933	(a)	1,000	869	840	933	717	833	933
14	974	857	919	933	933	1,000	869	840	933	(a)	833	933
15	(a)	857	960	(a)	1,667	1,000	(a)	833	933	717	833	933
16	974	857	960	933	1,667	1,000	869	833	(a)	717	833	(a)
17	974	857	960	933	1,667	1,000	869	833	933	717	833	933
18	974	857	(a)	933	1,667	1,000	869	833	933	717	(a)	933
19	964	(a)	960	933	1,667	1,000	852	(a)	933	717	833	1,000
20	964	857	960	933	1,667	1,000	852	833	925	717	833	1,000
21	964	857	960	933	1,667	933	852	833	925	(a)	833	1,000
22	(a)	857	866	(a)	1,667	933	(a)	825	925	717	917	1,000
23	964	857	866	933	1,667	933	852	825	(a)	717	917	(a)
24	964	857	866	933	1,667	(a)	852	825	925	717	917	1,000
25	964	857	(a)	933	1,667	933	852	825	925	695	(a)	1,000
26	964	(a)	866	933	1,667	933	852	(a)	925	695	917	933
27	964	857	866	933	1,667	933	852	825	818	695	917	933
28	964	857	866	933	1,667	933	852	825	818	(a)	933	933
29	(a)	857	866	(a)	1,667	933	(a)	825	818	695	933	933
30	964	-------	866	933	1,667	933	852	825	(a)	695	933	(a)
31	964	-------	866	-------	1,667	-------	852	825	-------	695	-------	933
Mean	969	861	910	909	1,363	1,117	884	836	878	741	829	948

1889.

1	933	933	1,000	1,000	1,000	933	933	933	(a)	850	894	(a)
2	933	933	1,000	1,000	1,000	933	933	933	866	850	894	858
3	933	933	1,000	1,000	1,000	933	933	933	866	850	(a)	858
4	933	933	1,000	1,000	1,000	933	933	(a)	866	835	894	858
5	933	933	1,000	1,000	1,000	933	933	933	866	835	894	858
6	(a)	933	1,000	1,000	1,000	933	933	933	850	(a)	894	858
7	933	1,000	1,000	1,000	1,000	933	(a)	933	850	835	894	858
8	933	1,000	1,000	1,000	1,000	933	933	933	(a)	835	894	(a)
9	933	1,000	1,000	1,000	1,000	933	933	933	850	835	894	858
10	933	1,000	1,000	1,000	1,000	933	933	933	850	883	(a)	858
11	933	1,000	1,000	1,000	1,000	933	933	(a)	850	883	894	858
12	933	1,000	1,000	1,000	1,000	933	933	933	850	883	894	858
13	(a)	1,000	1,000	1,000	1,000	933	933	933	850	(a)	894	749
14	933	1,000	1,033	1,000	1,000	933	(a)	933	850	883	894	749
15	933	1,000	1,033	1,000	1,000	933	933	933	(a)	883	894	(a)
16	933	1,000	1,033	1,000	1,000	933	933	933	850	883	894	749
17	933	1,000	1,033	1,000	1,000	933	933	933	850	830	(a)	749
18	933	1,000	1,033	1,000	1,000	933	933	(a)	850	830	894	749
19	933	1,000	1,033	1,000	1,000	933	933	933	850	830	894	749
20	(a)	1,000	1,033	1,000	1,000	933	933	933	850	(a)	894	950
21	933	1,000	1,414	1,000	1,000	933	(a)	933	850	830	865	950
22	933	1,000	1,414	1,000	1,000	933	933	904	(a)	830	865	(a)
23	1,000	1,000	1,414	1,000	1,000	933	933	904	850	830	865	950
24	1,000	1,000	1,414	1,000	1,000	933	933	904	850	830	(a)	950
25	1,000	1,000	1,414	1,000	1,000	933	933	-------	850	830	865	950
26	1,000	1,000	1,414	1,000	1,000	933	933	904	850	830	865	967
27	1,000	1,000	1,414	1,000	1,000	933	933	904	850	(a)	865	967
28	1,000	1,000	1,000	1,000	1,000	933	(a)	904	850	830	865	967
29	1,000	-------	1,000	1,000	1,000	933	933	866	(a)	830	858	(a)
30	1,000	-------	1,000	1,000	933	(a)	933	866	850	830	858	967
31	933	-------	1,000	-------	933	-------	933	866	-------	894	-------	967
Mean	952	985	1,101	1,000	996	933	933	919	853	847	883	872

a Sunday; gates closed.

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1890.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	967	982	982	904	1,336	(a)	957	904	873	881	898	965
2	967	(a)	(a)	904	1,336	1,262	957	904	873	881	(a)	965
3	967	982	982	904	1,336	884	957	(a)	873	973	898	965
4	967	982	982	904	1,336	884	957	904	866	973	898	965
5	(a)	982	982	904	1,336	884	957	904	866	(a)	898	965
6	967	973	991	(a)	1,336	1,059	(a)	904	866	973	973	965
7	967	973	991	904	1,336	1,059	957	896	(a)	973	973	(a)
8	967	973	991	904	1,336	(a)	957	896	866	973	973	965
9	967	(a)	(a)	904	1,336	1,059	957	896	866	973	(a)	965
10	967	973	991	919	1,336	1,059	957	(a)	866	1,063	973	965
11	967	973	901	919	1,336	1,059	957	896	858	1,063	973	956
12	(a)	973	991	919	1,336	957	957	896	858	(a)	973	956
13	967	973	889	(a)	1,336	957	(a)	896	858	1,063	965	956
14	967	982	889	919	1,336	957	957	896	(a)	1,063	965	(a)
15	967	982	889	919	1,336	(a)	957	896	858	1,063	965	956
16	881	(a)	(a)	919	1,336	957	957	896	858	956	(a)	956
17	881	982	889	1,336	1,336	957	425	(a)	858	956	965	956
18	881	982	889	1,336	1,336	957	425	896	873	956	965	1,046
19	(a)	982	889	1,336	1,336	957	425	896	873	(a)	965	1,046
20	881	982	896	1,336	1,336	957	(a)	896	873	956	973	1,046
21	881	982	896	1,336	1,336	957	425	733	(a)	956	973	(a)
22	881	982	896	1,336	1,336	(a)	425	733	873	956	973	1,046
23	881	(a)	(a)	1,336	1,336	957	425	733	873	898	(a)	1,046
24	881	982	896	1,336	1,336	957	800	(a)	873	898	973	1,046
25	881	982	896	1,336	1,336	957	800	733	881	898	973	1,046
26	(a)	982	896	1,336	1,336	957	800	733	881	(a)	973	1,034
27	881	982	904	1,336	1,336	957	(a)	733	881	898	965	1,034
28	881	982	904	1,336	1,262	957	800	873	(a)	898	965	(a)
29	881	-------	904	1,336	1,262	(a)	800	873	881	898	965	1,034
30	982	-------	(a)	1,336	1,262	957	800	873	881	898	(a)	1,034
31	982	-------	904	-------	1,262	-------	904	(a)	-------	898	-------	1,034
Mean	930	979	931	1,123	1,326	981	802	857	869	957	958	994

1891.

1	1,034	(a)	(a)	1,670	1,670	1,008	991	947	916	877	(a)	793
2	1,034	956	965	1,670	1,670	1,008	973	(a)	916	877	922	793
3	1,034	956	965	1,670	1,670	1,008	973	947	916	877	922	793
4	(a)	956	965	1,670	1,670	800	973	947	916	(a)	922	793
5	1,034	956	973	(a)	1,414	800	(a)	947	916	852	922	793
6	1,034	956	973	1,670	1,414	800	973	966	(a)	852	922	(a)
7	1,034	956	973	1,670	1,149	(a)	973	966	916	852	922	767
8	929	(a)	(a)	1,670	1,149	1,008	973	966	916	852	(a)	767
9	929	956	973	1,670	1,149	1,008	672	(a)	916	852	875	767
10	929	956	973	1,670	-------	1,008	872	966	916	852	875	767
11	(a)	965	973	1,670	1,017	999	672	966	916	(a)	875	767
12	977	965	973	(a)	1,017	999	(a)	966	916	966	875	767
13	977	965	973	1,670	1,017	999	672	690	(a)	966	875	(a)
14	977	965	973	1,670	1,017	(a)	672	690	906	966	875	741
15	977	(a)	(a)	1,670	1,017	999	672	690	906	966	(a)	741
16	977	965	973	1,670	1,017	999	973	(a)	906	966	875	741
17	977	965	973	1,670	(a)	999	973	690	906	966	875	741
18	(a)	965	973	1,670	1,017	991	973	690	906	(a)	875	741
19	977	961	973	(a)	1,017	991	(a)	690	906	924	875	741
20	977	961	991	1,670	1,017	991	853	933	(a)	924	875	(a)
21	977	961	991	1,670	1,008	(a)	853	933	887	924	975	741
22	977	(a)	(a)	1,670	1,008	991	853	933	887	924	(a)	741
23	977	961	991	1,670	1,008	991	717	(a)	887	924	806	741
24	977	961	991	1,670	(a)	991	717	911	887	924	806	741
25	(a)	961	514	1,670	1,008	991	717	911	887	(a)	806	741
26	977	965	514	(a)	1,008	991	(a)	911	887	922	806	741
27	977	965	514	1,670	1,008	991	717	911	(a)	922	806	(a)
28	956	965	514	1,670	1,008	(a)	717	911	877	922	806	754
29	956	-------	(a)	1,670	1,008	991	717	911	877	922	(a)	754
30	956	-------	1,670	1,670	1,008	991	947	(a)	877	922	793	754
31	956	-------	1,670	-------	(a)	-------	947	916	-------	922	-------	754
Mean	981	961	958	1,670	1,155	975	835	881	902	912	866	758

(a) Sunday; gates closed.

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1892.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	754	855	793	741	(a)	724	595	819	833	667	582	583
2	754	855	793	741	722	724	595	819	833	(a)	582	583
3	(a)	855	793	(a)	722	724	(a)	819	833	633	582	583
4	638	855	793	741	722	724	595	819	(a)	633	582	(a)
5	638	855	793	741	722	(a)	595	819	800	633	582	573
6	638	855	(a)	741	722	724	595	819	800	633	(a)	573
7	638	(a)	780	741	722	724	595	(a)	800	633	582	573
8	638	806	780	741	(a)	724	595	806	800	633	582	573
9	638	806	780	741	709	724	595	806	800	(a)	582	573
10	(a)	806	780	(a)	709	724	(a)	806	800	600	582	573
11	819	806	780	617	709	724	867	806	(a)	600	582	(a)
12	819	806	780	617	709	(a)	867	806	750	600	582	583
13	819	806	(a)	617	709	793	867	806	750	600	(a)	583
14	819	(a)	767	617	709	793	867	(a)	750	600	521	583
15	819	806	767	617	(a)	793	867	831	750	600	521	583
16	819	806	767	617	754	793	867	831	750	(a)	521	583
17	(a)	806	767	(a)	754	793	(a)	831	750	600	521	583
18	867	806	767	806	754	793	896	831	(a)	600	521	(a)
19	867	806	767	806	754	(a)	896	831	700	600	521	583
20	867	806	(a)	806	754	750	896	831	700	600	(a)	583
21	867	(a)	754	806	754	750	896	(a)	700	600	601	583
22	867	780	754	806	(a)	750	896	875	700	600	601	583
23	868	780	754	806	724	750	896	875	700	(a)	601	583
24	(a)	780	754	(a)	724	750	(a)	875	700	582	601	583
25	855	780	754	722	724	750	892	875	(a)	582	601	(a)
26	855	780	754	722	724	(a)	892	875	667	582	601	567
27	855	780	(a)	722	724	595	892	875	667	582	(a)	567
28	855	(a)	741	722	725	595	892	(a)	667	582	583	567
29	855	793	741	722	(a)	595	892	833	667	582	583	567
30	855	-------	741	722	724	595	892	833	667	(a)	583	567
31	(a)	-------	741	-------	724	-------	(a)	833	-------	582	-------	567
Mean	792	811	768	723	727	726	796	833	744	605	572	577

1893.

1	167	558	601	442	733	900	833	750	750	767	650	600
2	600	558	601	167	733	900	167	750	750	783	650	600
3	600	558	601	590	733	900	750	775	167	783	650	200
4	600	558	601	590	733	167	750	775	767	783	650	833
5	600	167	167	590	733	900	750	775	767	783	167	833
6	600	592	610	590	733	900	750	167	767	783	750	833
7	600	592	610	590	167	900	750	767	767	783	750	833
8	167	592	610	590	533	900	750	767	767	133	750	833
9	592	592	610	167	533	900	167	767	767	800	750	833
10	592	592	610	517	533	900	733	767	167	800	750	200
11	592	592	610	517	533	-------	733	167	767	800	750	867
12	592	167	167	517	533	783	733	167	767	800	167	833
13	592	600	612	517	533	783	733	167	767	800	733	833
14	592	600	612	517	167	783	733	750	767	800	733	833
15	167	600	612	517	433	783	733	750	767	-------	733	833
16	582	600	612	167	433	783	167	750	767	750	733	833
17	582	600	612	575	433	783	800	750	767	750	733	200
18	582	600	612	575	433	-------	800	750	767	750	733	833
19	582	167	167	575	433	733	800	750	767	750	333	833
20	582	600	533	575	433	733	800	167	767	750	800	833
21	582	600	533	575	-------	733	800	742	767	750	800	833
22	167	600	533	575	833	733	800	742	767	750	800	833
23	558	600	533	167	833	733	167	742	767	750	550	833
24	558	600	533	708	833	733	833	742	767	750	550	200
25	558	600	533	708	833	-------	833	742	783	750	550	833
26	558	167	167	708	833	833	833	742	783	417	183	833
27	558	601	442	708	833	833	833	167	783	417	833	833
28	558	601	442	708	-------	833	833	750	783	417	833	833
29	167	-------	442	708	900	833	833	750	783	167	833	833
30	558	-------	442	167	900	833	167	750	783	650	600	833
31	558	-------	442	-------	900	-------	700	750	-------	650	-------	200
Mean	514	520	510	521	628	797	679	640	729	687	650	717

(a) Sunday; gates closed.

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1894.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	833	800	667	167	667	450	167	717	567	550	542	533
2	833	800	667	458	800	450	800	717	167	550	542	133
3	833	800	667	458	800	167	800	717	558	550	542	533
4	833	167	(a)	458	800	600	222	717	558	550	133	533
5	833	667	682	500	800	600	133	167	558	550	533	533
6	833	667	682	500	133	700	133	717	558	550	533	533
7	208	667	682	500	800	700	133	717	558	133	533	533
8	833	667	682	167	800	700	133	717	558	550	533	533
9	833	667	682	382	800	700	783	717	167	550	533	133
10	833	667	682	382	800	167	783	717	558	550	533	767
11	833	167	(a)	382	800	758	783	717	558	550	133	767
12	833	667	525	382	800	758	783	100	558	550	542	767
13	833	667	525	382	133	758	783	667	558	550	542	767
14	208	667	525	517	800	758	783	667	558	133	542	767
15	833	667	525	167	800	758	167	667	558	542	542	767
16	833	667	525	500	800	758	817	667	133	542	542	133
17	833	667	525	500	800	167	817	667	567	542	542	767
18	833	167	(a)	500	800	758	817	667	567	542	133	767
19	833	667	533	500	800	758	817	100	567	542	542	767
20	833	667	533	500	133	758	817	667	567	542	542	767
21	208	667	533	500	582	758	817	667	567	133	542	767
22	833	667	533	167	582	758	167	667	567	542	542	767
23	883	667	533	675	582	758	800	667	133	542	542	133
24	833	667	533	675	582	167	800	667	558	542	542	758
25	833	667	(a)	675	582	800	800	667	558	542	133	758
26	833	667	550	675	582	800	800	333	558	542	533	758
27	833	667	550	675	133	800	800	667	558	542	533	758
28	208	667	550	675	450	800	800	667	558	133	533	758
29	800	-------	550	133	450	800	167	667	558	542	533	758
30	800	-------	550	667	450	800	717	567	133	542	533	133
31	800	-------	550	-------	450	-------	717	567	-------	542	-------	758
Mean	749	628	583	461	622	649	608	613	491	492	484	610

1895.

1	758	700	667	667	783	700	675	533	133	550	617	250
2	758	700	667	667	700	167	675	533	600	550	617	500
3	758	133	133	667	700	700	675	533	600	550	208	500
4	758	750	667	500	700	700	167	400	600	550	617	500
5	758	750	667	500	167	700	167	600	600	550	617	500
6	133	750	667	500	700	700	167	600	600	133	617	500
7	758	750	667	167	700	700	167	600	600	533	617	500
8	758	750	667	400	700	700	667	600	133	533	617	125
9	758	750	667	400	700	167	667	600	583	533	617	500
10	758	133	133	400	700	693	667	600	583	533	208	500
11	758	700	667	400	700	693	667	133	583	533	617	500
12	758	700	667	400	167	693	667	533	583	533	617	500
13	133	700	667	400	700	693	667	533	583	133	617	500
14	742	700	667	133	700	693	133	533	583	267	617	500
15	742	700	667	333	700	693	667	533	133	267	617	250
16	742	700	667	333	700	167	667	533	575	400	617	500
17	742	133	-------	333	700	683	667	533	575	533	104	500
18	742	700	667	667	700	683	667	133	575	533	417	500
19	742	700	667	667	167	683	667	550	575	533	417	500
20	133	700	667	667	700	683	667	550	575	267	417	500
21	750	700	667	167	700	683	133	550	575	500	417	500
22	750	700	667	667	700	683	567	550	133	500	217	250
23	750	700	667	667	700	167	567	550	567	500	217	417
24	750	133	-------	667	700	675	567	550	567	500	217	417
25	750	667	667	783	700	675	567	133	567	500	483	417
26	750	667	667	783	167	675	567	517	567	500	483	333
27	133	667	667	783	700	675	567	517	567	250	483	333
28	700	667	500	167	700	675	133	517	567	617	483	333
29	700	-------	500	783	700	675	533	600	133	617	250	200
30	700	-------	500	783	700	167	533	600	550	617	250	533
31	700	-------	167	-------	700	-------	533	600	-------	617	-------	533
Mean	665	625	596	512	634	601	519	511	505	475	464	432

(a) Sunday; gates closed.

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1896.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	533	533	133	450	1,167	933	950	817	817	800	100	800
2	267	267	300	450	1,167	933	950	117	817	800	800	800
3	267	533	617	450	1,167	933	950	808	817	800	800	800
4	267	533	617	450	883	883	467	808	817	100	800	800
5	250	533	-------	-------	883	883	133	808	817	800	800	800
6	533	533	-------	667	883	883	950	808	117	800	800	100
7	533	533	-------	667	883	100	950	808	725	800	633	800
8	533	400	-------	667	767	933	950	808	725	800	100	800
9	533	133	633	667	767	933	950	117	725	800	800	800
10	533	547	633	467	167	933	950	800	725	800	800	800
11	533	547	633	467	883	933	950	800	725	100	800	800
12	267	547	633	118	883	933	133	800	725	800	800	800
13	533	547	633	467	883	933	933	800	100	400	633	100
14	533	547	633	467	883	100	933	800	833	633	633	833
15	533	547	-------	600	883	917	933	800	833	633	100	833
16	533	137	633	600	883	917	933	117	833	633	800	833
17	533	547	633	333	167	917	933	800	200	633	800	833
18	533	547	633	333	917	917	933	800	200	100	800	833
19	267	547	633	133	917	917	133	800	-------	633	800	833
20	533	547	317	900	917	917	800	800	100	633	800	100
21	533	547	158	900	883	100	800	800	817	633	800	817
22	533	547	-------	900	883	917	800	800	817	633	100	817
23	533	137	500	900	883	917	800	100	817	633	800	817
24	533	533	500	900	133	917	800	833	817	800	800	817
25	533	533	500	900	933	917	800	833	817	100	800	817
26	267	533	500	900	933	950	117	833	817	800	800	100
27	533	533	500	1,167	933	950	767	833	100	800	800	817
28	533	533	500	1,167	933	133	767	833	800	800	800	817
29	533	533	-------	1,167	933	950	817	783	800	800	100	817
30	533	-------	450	1,167	117	950	817	100	800	633	800	817
31	533	-------	450	-------	117	-------	817	817	-------	633	-------	817
Mean	472	484	515	670	795	815	771	696	657	638	667	721

1897.

1	817	817	833	542	667	817	833	(a)	950	775	833	917
2	817	817	833	542	(a)	817	833	1,433	950	775	833	917
3	(a)	817	833	542	600	817	833	1,433	950	(a)	833	917
4	700	817	833	(a)	600	817	(a)	1,433	950	933	833	917
5	700	817	833	367	600	817	250	1,433	(a)	933	833	(a)
6	700	817	833	367	600	(a)	250	1,433	933	933	833	917
7	700	(a)	(a)	367	600	617	250	1,433	933	933	(a)	917
8	700	817	833	367	600	617	250	(a)	933	933	700	917
9	700	817	833	367	(a)	617	250	1,000	933	933	700	917
10	(a)	817	833	367	617	617	250	1,000	933	(a)	700	917
11	817	817	833	(a)	617	617	(a)	1,000	933	933	700	917
12	817	817	833	383	617	617	900	1,000	(a)	933	700	(a)
13	817	817	833	383	617	(a)	900	1,000	933	933	700	867
14	817	(a)	(a)	383	617	800	900	1,000	933	933	(a)	867
15	817	758	800	383	617	800	900	(a)	933	933	833	867
16	817	758	800	383	(a)	800	900	883	933	933	833	867
17	(a)	758	800	383	650	800	900	883	933	(a)	833	867
18	817	758	800	(a)	650	800	(a)	883	933	967	833	867
19	817	758	800	567	650	800	1,033	883	(a)	967	833	(a)
20	817	758	800	567	650	(a)	1,033	883	917	967	833	933
21	817	(a)	(a)	567	650	833	1,033	883	917	967	(a)	933
22	817	833	667	567	650	833	1,033	(a)	917	967	867	933
23	817	833	667	567	(a)	833	1,033	917	917	967	867	933
24	(a)	833	667	567	742	833	1,033	917	917	(a)	867	933
25	817	833	667	(a)	742	833	(a)	917	917	1,000	867	933
26	817	833	667	667	742	833	1,200	917	(a)	1,000	867	(a)
27	817	833	667	667	742	(a)	1,200	917	775	1,000	867	933
28	817	(a)	(a)	667	742	833	1,200	917	775	1,000	(a)	933
29	817	-------	542	667	742	833	1,200	(a)	775	1,000	917	933
30	817	-------	542	667	(a)	833	1,200	950	775	1,000	917	933
31	(a)	-------	542	-------	817	-------	1,200	950	-------	(a)	-------	933
Mean	790	806	756	495	659	772	844	1,050	908	944	817	912

(a) Sunday; gates closed.

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	933	933	933	800	2,000	1,000	993	1,000	1,000	967	800	600
2	333	933	933	800	2,000	1,000	993	1,000	1,000	233	800	600
3	933	933	933	267	2,000	1,000	250	1,000	1,000	1,000	800	600
4	933	933	933	900	2,000	1,000	1,053	1,000	250	1,000	800	300
5	933	933	933	900	2,000	333	1,053	1,000	1,000	1,000	800	800
6	933	667	667	900	2,000	1,000	1,053	1,000	1,000	1,000	200	800
7	933	933	933	900	2,000	1,000	1,053	250	1,000	1,000	800	800
8	933	933	933	900	1,000	1,000	1,053	1,000	1,000	1,000	800	800
9	333	933	933	900	1,000	1,000	1,053	1,000	1,000	250	800	800
10	933	933	933	833	1,000	1,000	250	1,000	1,000	983	800	800
11	933	933	933	867	1,000	1,000	1,000	1,000	250	983	800	300
12	933	933	933	867	1,000	417	1,000	1,000	968	983	800	783
13	933	667	667	867	1,000	1,000	1,000	1,000	967	983	200	783
14	933	933	933	867	1,000	1,000	1,000	250	967	983	800	783
15	933	933	933	867	1,000	1,000	1,000	1,000	967	983	800	783
16	333	933	933	867	1,000	1,000	1,000	1,000	967	250	800	783
17	933	933	667	83	1,000	1,000	250	1,000	967	983	800	783
18	933	933	667	1,000	1,000	1,000	1,000	1,000	250	983	800	300
19	933	933	667	1,000	1,000	500	1,000	1,000	967	983	800	783
20	933	667	167	1,000	1,000	1,000	1,000	1,000	967	983	300	783
21	933	933	667	1,000	1,000	1,000	1,000	250	967	983	700	783
22	933	933	667	1,000	333	1,000	1,000	1,000	967	983	700	783
23	333	933	667	1,000	1,000	1,000	1,000	1,000	967	250	800	783
24	933	933	667	1,000	1,000	1,000	250	1,000	967	800	800	783
25	933	933	667	2,000	1,000	1,000	983	1,000	233	800	800	300
26	933	933	667	2,000	1,000	500	983	1,000	967	800	800	783
27	933	667	167	2,000	1,000	993	983	1,000	967	800	300	783
28	933	933	800	2,000	1,000	993	983	250	967	800	600	783
29	933	-------	800	2,000	417	993	983	1,000	967	800	600	783
30	333	-------	800	2,000	1,000	993	983	1,000	967	200	600	783
31	933	-------	800	-------	1,000	-------	250	1,000	-------	800	-------	783
Mean	836	895	772	1,079	1,185	924	886	903	852	824	700	706

1899.

1	300	767	767	683	667	667	750	667	700	233	667	643
2	783	767	767	250	667	667	233	667	700	667	667	643
3	783	767	767	500	667	667	750	667	233	667	667	233
4	783	767	767	500	667	233	750	667	683	667	667	661
5	783	250	250	500	667	667	750	667	683	667	233	661
6	783	750	667	500	667	667	750	233	683	667	663	661
7	783	750	667	500	233	667	750	667	683	667	663	661
8	250	750	667	500	667	667	750	667	683	233	663	661
9	767	750	667	267	667	667	233	667	683	633	263	661
10	767	750	667	500	667	667	667	967	233	633	663	233
11	767	750	667	533	667	233	667	667	683	633	663	637
12	767	250	250	533	667	667	667	667	683	633	233	637
13	767	750	667	533	667	667	667	233	683	633	660	637
14	767	750	667	533	233	667	667	667	683	633	660	637
15	250	750	667	533	667	667	667	667	683	233	660	637
16	767	750	667	267	667	667	233	667	683	633	660	637
17	767	750	667	533	667	667	667	667	233	633	660	283
18	767	750	667	533	667	233	667	667	667	683	660	637
19	767	250	250	533	667	667	667	667	667	683	233	637
20	767	767	683	533	667	667	667	233	667	683	655	637
21	767	767	683	533	233	667	667	700	667	683	655	637
22	250	767	683	533	667	667	667	700	667	233	655	637
23	767	767	683	267	667	667	233	700	667	667	655	637
24	767	767	683	567	667	667	667	700	233	667	655	250
25	767	767	683	567	667	233	667	700	667	667	655	583
26	767	250	250	567	667	750	667	700	667	667	233	583
27	767	767	683	567	667	750	667	233	667	667	643	583
28	767	767	683	567	233	750	667	700	667	667	643	583
29	250	-------	683	567	667	750	667	700	667	233	643	583
30	767	-------	683	233	667	750	233	700	667	667	643	583
31	767	-------	683	-------	667	-------	667	700	-------	667	-------	417
Mean	688	689	632	491	611	623	615	622	618	590	601	574

Daily discharge, in second-feet, of Presumpscot River, etc.—Continued.

1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	500	493	500	467	1,833	975	367	770	653	793	647	667
2	500	493	500	750	1,833	975	807	770	330	793	647	365
3	500	493	500	750	1,833	650	807	770	643	793	647	683
4	500	367	417	750	1,833	827	807	770	643	793	370	683
5	500	367	493	750	1,833	827	807	361	643	793	647	683
6	500	367	493	750	1,833	827	807	761	643	793	647	683
7	367	367	493	750	1,833	827	807	761	643	350	647	683
8	483	617	493	383	1,833	827	361	761	643	525	647	683
9	483	617	493	607	1,833	827	793	761	324	525	647	347
10	483	617	493	607	1,833	633	793	761	637	525	647	667
11	483	367	417	607	1,833	833	793	761	637	525	370	667
12	483	600	633	607	1,833	833	793	361	637	525	613	667
13	483	347	633	607	1,833	833	793	655	637	525	613	667
14	367	347	633	607	1,191	833	793	655	637	341	613	667
15	467	347	633	383	1,191	833	361	655	637	603	613	667
16	467	347	633	900	1,191	833	787	655	324	603	613	420
17	467	633	633	900	1,191	561	787	655	620	603	613	653
18	467	400	217	900	1,191	760	787	655	620	603	365	653
19	467	633	808	900	1,191	760	787	330	620	603	665	653
20	467	633	808	900	650	760	787	650	620	603	665	653
21	367	633	808	900	841	760	787	650	620	341	665	653
22	467	633	808	383	841	760	361	650	620	623	665	653
23	467	633	808	1,193	841	760	780	650	330	623	665	420
24	467	633	808	1,193	841	391	780	650	707	623	665	651
25	467	367	247	1,103	841	613	780	650	707	623	365	651
26	467	500	627	1,193	841	613	780	330	707	623	667	651
27	467	500	627	1,193	650	613	780	653	707	623	667	651
28	367	500	627	1,193	975	613	780	653	707	341	667	651
29	493	-------	627	1,833	975	613	361	653	707	647	667	651
30	493	-------	627	1,833	975	613	770	653	330	647	667	283
31	493	-------	627	-------	975	-------	770	653	-------	647	-------	647
Mean	466	495	586	866	1,330	746	721	649	598	599	610	615

1901.

1	647	673	667	538	673	728	747	693	300	650	630	267
2	647	673	667	538	673	466	747	693	653	650	630	697
3	647	550	550	538	673	993	747	693	653	650	283	697
4	647	667	693	538	673	993	747	300	653	650	717	697
5	647	667	693	538	333	993	747	693	653	650	717	697
6	367	667	693	538	683	993	747	693	653	283	717	697
7	643	667	693	367	683	993	400	693	653	647	717	697
8	643	667	693	0	683	993	713	693	300	647	717	267
9	643	667	693	0	683	466	713	693	642	647	717	700
10	643	550	567	15	333	795	713	693	642	647	283	700
11	643	660	733	175	333	795	713	300	642	647	667	700
12	643	660	733	175	333	795	713	520	642	647	667	700
13	367	660	467	175	693	795	713	520	642	283	667	700
14	641	660	467	300	693	795	400	520	642	317	667	700
15	641	660	583	633	693	795	707	520	300	317	667	200
16	641	660	667	633	693	450	707	520	667	317	667	583
17	641	517	333	633	693	712	707	520	667	643	233	583
18	641	673	733	633	693	712	707	300	667	643	663	700
19	641	673	733	633	333	712	707	543	667	643	663	700
20	641	673	733	633	708	712	707	543	667	283	663	700
21	637	673	733	300	708	712	400	543	667	687	663	700
22	637	673	500	500	708	712	700	543	300	687	663	200
23	637	673	500	333	708	400	700	543	658	687	663	700
24	637	550	333	333	350	623	700	543	658	687	267	700
25	637	667	683	333	350	623	700	300	658	687	657	700
26	637	667	683	667	333	623	700	662	658	687	657	700
27	367	667	683	667	728	623	700	662	658	283	657	700
28	673	667	683	333	728	623	300	662	658	630	657	700
29	673	-------	683	673	728	623	693	662	300	630	657	200
30	673	-------	683	673	728	400	693	662	650	630	657	700
31	673	-------	367	-------	728	-------	693	662	-------	630	-------	700
Mean	619	649	623	466	605	722	670	575	596	574	618	616

The following tables give the maximum, minimum, and mean monthly discharge of Presumpscot River and the rainfall and run-off of the basin. The mean discharge is computed for the days on which the flow is given, while the run-off is computed for the total number of days in the month. There is only one rainfall station in the basin, viz, at North Bridgton, and that is maintained by a voluntary observer. As the record at that station is short the record of the United States Signal Service at Portland is given instead, as representing approximately the rainfall in the Presumpscot Basin.

Estimated monthly discharge of Presumpscot River at the outlet of Sebago Lake.

[Drainage area, 470 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1887.						
January	933	860	902	1.60	1.84	3.89
February	933	933	933	1.70	1.77	5.73
March	1,003	850	920	1.71	1.97	4.15
April	933	933	933	1.72	1.92	4.96
May	1,000	933	979	1.95	2.25	1.93
June	1,000	908	978	2.01	2.24	4.07
July	933	837	901	1.61	1.86	4.70
August	974	837	898	1.66	1.91	6.56
September	933	933	933	1.72	1.92	0.70
October	933	933	933	1.66	1.91	2.47
November	933	933	933	1.72	1.92	4.74
December	964	933	950	1.76	2.03	5.17
The year	1,003	837	933	1.74	23.54	49.07
1888.						
January	974	964	969	1.73	1.99	6.05
February	964	857	861	1.58	1.70	5.40
March	960	866	910	1.69	1.95	3.72
April	933	866	909	1.61	1.80	3.80
May	1,667	933	1,363	2.71	3.13	3.36
June	1,667	933	1,117	2.30	2.56	2.79
July	933	852	884	1.58	1.82	1.90
August	852	825	836	1.55	1.79	4.33
September	933	818	878	1.56	1.74	8.22
October	818	695	741	1.38	1.59	7.47
November	933	695	829	1.53	1.71	7.46
December	1,000	933	948	1.69	1.95	4.71
The year	1,667	695	937	1.74	23.73	59.24
1889.						
January	1,000	933	952	1.83	2.11	3.47
February	1,000	933	985	2.10	2.19	2.74
March	1,414	1,000	1,101	2.34	2.70	2.68
April	1,000	1,000	1,000	2.13	2.38	2.39
May	1,000	933	996	2.12	2.45	2.65
June	933	933	933	1.92	2.14	3.26
July	933	933	933	1.73	1.99	3.10
August	933	866	919	1.71	1.97	2.76
September	866	850	853	1.51	1.68	2.49
October	894	830	847	1.57	1.81	3.47
November	894	858	883	1.63	1.82	7.95
December	967	749	872	1.56	1.80	4.96
The year	1,414	749	940	1.85	25.04	41.92
1890.						
January	982	881	930	1.73	1.99	2.89
February	982	973	979	1.78	1.85	4.04
March	991	889	931	1.66	1.91	6.24
April	1,336	904	1,123	2.23	2.49	2.51
May	1,336	1,262	1,326	2.82	3.26	6.10
June	1,262	884	981	1.74	1.94	4.53
July	957	425	802	1.49	1.72	3.58

Estimated monthly discharge of Presumpscot River, etc.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1890.						
August	904	733	857	1.58	1.82	2.99
September	881	858	869	1.60	1.79	4.88
October	1,063	881	957	1.78	2.05	6.82
November	973	898	958	1.70	1.90	2.31
December	1,046	956	994	1.84	2.12	5.08
The year	1,336	425	976	1.83	24.84	51.97
1891.						
January	1,034	929	981	1.82	2.10	7.71
February	965	956	961	1.75	1.82	4.31
March	1,670	514	958	1.71	1.97	5.48
April	1,670	1,670	1,670	3.08	3.44	1.89
May	1,670	1,008	1,155	2.14	2.47	3.47
June	1,008	800	975	1.79	2.00	2.77
July	973	717	835	1.55	1.79	4.78
August	966	690	881	1.57	1.81	1.15
September	916	877	902	1.66	1.85	1.94
October	966	852	912	1.69	1.95	3.22
November	922	793	866	1.53	1.71	2.38
December	793	741	758	1.40	1.61	4.17
The year	1,670	514	988	1.81	24.52	43.27
1892.						
January	867	638	792	1.42	1.64	4.22
February	855	780	811	1.49	1.61	2.18
March	793	741	768	1.42	1.64	2.27
April	806	617	723	1.33	1.48	1.04
May	754	709	727	1.30	1.50	4.41
June	793	595	726	1.33	1.48	4.60
July	896	595	796	1.42	1.64	2.68
August	875	806	833	1.54	1.78	8.14
September	833	667	744	1.37	1.53	2.89
October	667	582	605	1.08	1.25	1.64
November	601	521	572	1.06	1.18	3.76
December	583	567	577	1.07	1.23	1.32
The year	896	521	723	1.32	17.96	39.15
1893.						
January	600	167	514	1.09	1.26	2.19
February	601	167	530	1.13	1.18	4.51
March	612	167	510	1.09	1.26	3.58
April	708	167	521	1.11	1.24	3.71
May	900	167	628	1.25	1.44	7.59
June	900	167	797	1.53	1.71	3.62
July	833	167	679	1.44	1.66	0.96
August	775	167	640	1.36	1.57	2.74
September	783	167	729	1.55	1.73	2.33
October	800	167	687	1.41	1.63	5.13
November	833	167	650	1.38	1.54	1.83
December	867	200	717	1.53	1.76	5.42
The year	900	167	634	1.32	17.98	43.61
1894.						
January	833	208	749	1.59	1.83	3.13
February	800	167	628	1.34	1.39	2.70
March	682	525	583	1.08	1.25	1.97
April	675	133	461	0.98	1.09	2.55
May	800	133	622	1.32	1.52	7.33
June	800	167	649	1.38	1.54	2.01
July	817	133	608	1.29	1.49	2.96
August	717	100	613	1.30	1.50	3.27
September	567	133	491	1.04	1.16	2.76
October	550	133	492	1.05	1.21	4.65
November	542	133	484	1.03	1.15	2.05
December	767	133	610	1.30	1.50	1.75
The year	833	100	583	1.23	16.63	37.13
1895.						
January	758	133	665	1.41	1.63	2.47
February	750	133	625	1.33	1.38	0.94
March	667	133	596	1.19	1.37	3.37

Estimated monthly discharge of Presumpscot River, etc.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1895.						
April	783	133	512	1.09	1.22	5.95
May	783	167	634	1.35	1.56	1.59
June	700	167	601	1.28	1.43	1.97
July	675	133	519	1.10	1.27	3.59
August	600	133	511	1.09	1.26	4.72
September	583	133	505	1.07	1.19	1.79
October	617	133	475	1.01	1.16	1.91
November	617	104	464	0.99	1.10	7.18
December	533	125	432	0.92	1.06	3.30
The year	783	104	545	1.15	15.63	38.78
1896.						
January	533	250	472	1.00	1.15	2.00
February	547	133	484	1.03	1.11	5.27
March	633	133	515	0.85	0.98	8.02
April	1,167	118	670	1.38	1.54	1.65
May	1,167	117	795	1.69	1.95	3.21
June	950	100	815	1.73	1.93	2.23
July	950	117	771	1.64	1.89	3.10
August	833	100	696	1.48	1.71	2.57
September	833	100	657	1.35	1.51	9.57
October	800	100	638	1.36	1.57	3.19
November	800	100	667	1.42	1.58	2.45
December	833	100	721	1.53	1.76	2.18
The year	1,167	100	658	1.37	18.68	45.44
1897.						
January	817	700	790	1.41	1.63	4.09
February	833	758	806	1.47	1.53	2.60
March	833	542	756	1.40	1.61	4.55
April	667	367	495	0.91	1.02	2.60
May	817	600	659	1.17	1.35	5.87
June	833	617	772	1.42	1.58	4.97
July	1,200	250	844	1.57	1.81	2.62
August	1,433	883	1,050	1.87	2.16	1.41
September	950	775	908	1.67	1.86	2.34
October	1,000	775	944	1.69	1.95	0.45
November	917	700	817	1.51	1.68	6.69
December	933	867	912	1.69	1.95	4.22
The year	1,433	250	813	1.48	20.13	42.42
1898.						
January	933	333	836	1.78	2.05	6.61
February	933	667	895	1.90	1.98	7.61
March	933	167	772	1.64	1.89	1.21
April	2,000	83	1,079	2.30	2.56	4.33
May	2,000	333	1,185	2.52	2.91	2.62
June	1,000	333	924	1.97	2.20	3.98
July	1,053	250	886	1.88	2.17	1.78
August	1,000	250	903	1.92	2.21	3.88
September	1,000	233	852	1.81	2.02	3.48
October	1,000	200	824	1.75	2.02	5.90
November	800	200	700	1.49	1.66	5.51
December	800	300	706	1.50	1.73	2.85
The year	2,000	83	880	1.87	25.40	49.76
1899.						
January	783	250	688	1.46	1.68	3.39
February	767	250	689	1.47	1.53	3.41
March	767	250	632	1.34	1.54	6.49
April	683	233	491	1.04	1.16	1.55
May	667	233	611	1.30	1.50	0.73
June	750	233	623	1.33	1.48	1.04
July	750	233	615	1.31	1.51	3.92
August	700	233	622	1.32	1.52	1.66
September	700	233	618	1.31	1.46	4.47
October	683	233	590	1.26	1.45	1.46
November	667	233	601	1.28	1.43	3.11
December	643	233	574	1.22	1.41	2.84
The year	783	233	613	1.30	17.67	34.07

Estimated monthly discharge of Presumpscot River, etc.—Continued.

Month.	Discharge in second-feet.			Run-off.		Rainfall, in inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1900.						
January	500	367	466	0.99	1.14	6.28
February	633	347	495	1.05	1.09	9.25
March	808	217	586	1.25	1.44	6.00
April	1,833	383	866	1.84	2.05	2.25
May	1,833	650	1,330	2.83	3.27	4.09
June	975	391	746	1.59	1.77	1.25
July	807	361	721	1.53	1.76	1.70
August	770	330	649	1.38	1.59	3.72
September	707	324	598	1.27	1.42	2.56
October	793	341	599	1.27	1.46	5.81
November	667	365	610	1.30	1.45	5.50
December	683	283	615	1.31	1.51	2.38
The year	1,833	217	690	1.47	19.95	50.79
1901.						
January	673	367	619	1.32	1.52	3.34
February	673	333	649	1.38	1.44	1.65
March	733	333	623	1.33	1.53	4.88
April	673	15	466	0.92	1.03	5.58
May	728	333	605	1.29	1.49	3.29
June	993	400	722	1.54	1.72	5.45
July	747	300	670	1.43	1.60	0.91
August	693	300	575	1.22	1.36	2.48
September	667	300	596	1.27	1.46	2.92
October	687	283	574	1.22	1.41	1.72
November	717	233	618	1.31	1.46	1.91
December	700	200	616	1.31	1.51	6.02
The year	993	15	611	1.28	17.53	40.15

The following table gives the run-off in the Presumpscot Basin for the years 1887 to 1901, inclusive:

Run-off, in second-feet, per square mile, in basin of Presumpscot River.

[Drainage area, 470 square miles.]

Month.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Average.
January	1.60	1.73	1.83	1.73	1.82	1.42	1.09	1.59	1.41	1.00	1.41	1.78	1.46	0.99	1.32	1.48
February	1.70	1.58	2.10	1.78	1.75	1.49	1.13	1.34	1.33	1.03	1.47	1.90	1.47	1.05	1.38	1.50
March	1.71	1.69	2.34	1.66	1.71	1.42	1.09	1.08	1.19	0.85	1.40	1.64	1.34	1.25	1.33	1.45
April	1.72	1.61	2.13	2.23	3.08	1.33	1.11	0.98	1.09	1.38	0.91	2.30	1.04	1.84	0.92	1.58
May	1.95	2.71	2.12	2.82	2.14	1.30	1.25	1.32	1.35	1.69	1.17	2.52	1.30	2.83	1.29	1.85
June	2.01	2.30	1.92	1.74	1.79	1.33	1.53	1.38	1.28	1.73	1.42	1.97	1.33	1.59	1.54	1.66
July	1.61	1.58	1.73	1.49	1.55	1.42	1.44	1.29	1.10	1.64	1.57	1.88	1.31	1.53	1.43	1.50
August	1.66	1.55	1.71	1.58	1.57	1.54	1.36	1.30	1.09	1.48	1.87	1.92	1.32	1.38	1.22	1.50
September	1.72	1.56	1.51	1.60	1.66	1.37	1.55	1.04	1.07	1.35	1.67	1.81	1.31	1.27	1.27	1.45
October	1.66	1.38	1.57	1.78	1.69	1.08	1.41	1.05	1.01	1.36	1.69	1.75	1.26	1.27	1.22	1.41
November	1.72	1.53	1.63	1.70	1.53	1.06	1.38	1.03	0.99	1.42	1.51	1.49	1.28	1.30	1.31	1.39
December	1.76	1.69	1.56	1.84	1.40	1.07	1.53	1.30	0.92	1.53	1.69	1.50	1.22	1.31	1.31	1.44
The year	1.74	1.74	1.85	1.83	1.81	1.32	1.32	1.23	1.15	1.37	1.48	1.87	1.30	1.47	1.28	1.52

Ratio of run-off to rainfall in basin of Presumpscot River and Sebago Lake.

	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Average.
Precipitation, inches	49.07	59.24	41.92	51.97	43.27	39.15	43.61	37.14	38.78	45.44	42.42	49.76	34.07	50.70	40.15	44.45
Run-off, inches	23.54	23.73	25.04	24.84	24.52	17.96	17.98	16.63	15.63	18.68	20.13	25.40	17.67	19.95	17.53	20.62
Ratio	0.48	0.40	0.60	0.48	0.57	0.46	0.41	0.45	0.40	0.41	0.47	0.51	0.52	0.39	0.44	0.46

SACO RIVER.

DRAINAGE BASIN.

Saco River rises in the White Mountain region of New Hampshire at an elevation of about 1,900 feet above the sea, and has a general southeasterly course to the Atlantic Ocean. (See Pl. X, p. 70.) The greatest length of the basin from Mount Washington to the sea is about 75 miles, the greatest width about 30 miles. The total drainage area is 1,750 square miles, about equally divided between Maine and New Hampshire. The general elevation of the basin is greater than that of any of the larger streams of Maine except the Androscoggin. The headwaters are in one of the highest and roughest mountain regions in the eastern portion of the United States, with steep, wooded slopes and narrow river valleys and with heavy falls to the mountain streams. The mountains grow gradually lower, however, as the ocean is approached, becoming undulating hills in the central portion of the basin and comparatively flat land near the sea. The northern part of the basin is still largely wooded, while in the southern part practically all of the forests have been cut, so that more than half of the entire basin has been cleared. The country rock is granite, which abounds throughout the area, making excellent building material for dams and foundations. Gneisses and schists occur in places. The surface covering over the larger part of the region is sand and gravel.

The drainage area of the river at various points is given in the following table:

Drainage areas of Saco River.

	Sq. miles.
Fryeburg	439
Great Falls, at Hiram	856
Highland Rips	1,366
Bonny Eagle Falls	1,578
Salmon Falls	1,628
Union Falls	1,677
Saco and Biddeford	1,734
Mouth	1,753

The river is navigable as far as Biddeford and Saco, and has good transportation facilities nearly its entire length, being closely followed by the Maine Central Railroad.

LAKE STORAGE.

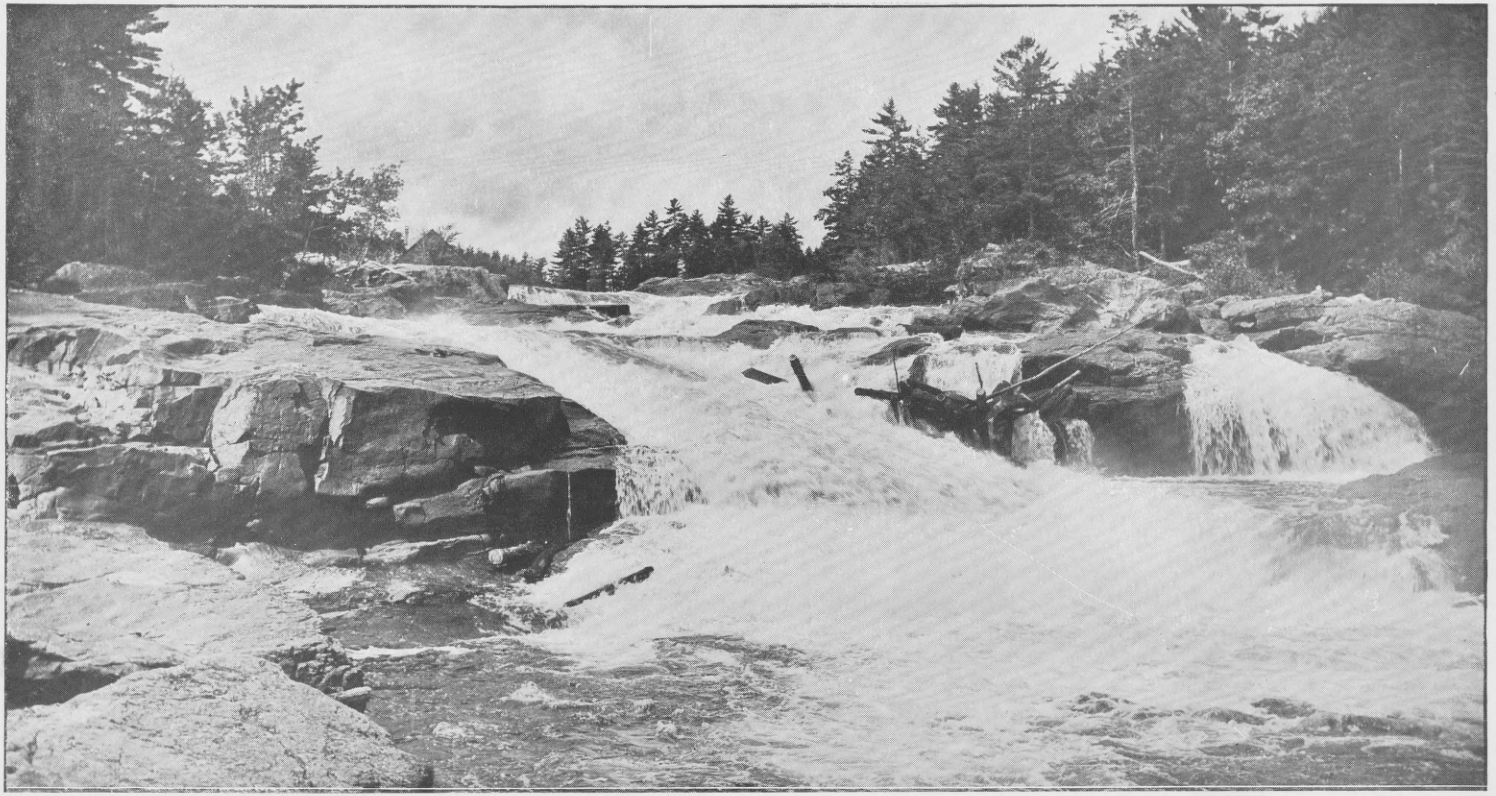
Although Saco River has no tributary lakes as large as Moosehead or the Schoodics, it contains about 84 square miles of lake surface, 55 square miles in Maine and 29 square miles in New Hampshire. No records of actual measurements of flow of the river are available. Wells states that during summer droughts the discharge at Saco is 300 cubic

feet per second average for the twenty-four hours, and Prof. George F. Swain estimated the minimum flow there at not far from 250 cubic feet per second. Near the headwaters, as has been stated, the river fluctuates rapidly, due to the mountainous character of the basin. Owing, however, to the marshes and lowlands, which are overflowed at the time of high water, to the narrowness of the "gates" (the passage at Hiram Falls which holds back the mountain water), to the comparative levelness of the lower part of the basin, and more particularly to the storage in lakes and ponds, the flow in the lower part of the stream is more constant. The flow could be regulated to a far greater extent, however, by the construction of small dams at the outlets of the lakes. The Saco Water Power Company controls Great Ossipee Lake, covering 3,809 acres, with 5 feet of storage; Moose Lake, covering 1,648 acres, with $9\frac{3}{4}$ feet of storage; and four other ponds ranging in size from 150 to 525 acres and in depth of storage from 4 to 9 feet. The extreme range between high and low water at the Great Falls is 12 feet, at the Bonny Eagle Falls 6 feet, and at Saco from 8 to 10 feet.

Ossipee River is the largest tributary of the Saco, entering the main stream near Great Falls. It drains Ossipee Lake, in New Hampshire; has a length of about 20 miles, and a drainage basin of 470 square miles. The storage in Ossipee and other lakes serves to render the flow rather uniform, and this fact, combined with the considerable fall (amounting to 142 feet below the source), gives the stream value for power.

WATER POWERS.

For the first few miles from its source Saco River is a mountainous stream, with fluctuating flow, becoming a rivulet in summer and a mountain torrent in the spring. It falls more than 1,100 feet in the first 12 miles, or about 90 feet per mile. In the next $18\frac{1}{2}$ miles the average slope in successive intervals steadily diminishes from $28\frac{1}{2}$ feet per mile to 6.8 feet per mile, the fall in the entire distance, from the western boundary of the town of Bartlett to the railroad crossing at Conway Center, amounting to 333 feet. Next follows a long stretch of dead water, with a fall of only 69 feet in 28 miles, or $2\frac{1}{2}$ feet per mile. Then are encountered the Great Falls at the town of Hiram, where the river descends 72 feet in a distance of about 900 feet (see Pl. XIV), and finally, in the 40 miles to tide water at Biddeford and Saco, the fall amounts in the aggregate to 271 feet, or an average of 6.6 feet per mile. The following table gives the fall in the river from its source to the sea:



GREAT FALLS ON SACO RIVER AT HIRAM.

Fall in Saco River.

Locality.	Distance from mouth of river.	Height above tide.	Fall between points.	Distance between points.	Average fall per mile between points.
	Miles.	*Feet.*	*Feet.*	*Miles.*	*Feet.*
Source of river	104	1,880			
			1,135	12.5	90.8
Western boundary of Bartlett	91½	745			
			185	6.5	28.5
Mouth of Rocky Branch	85	560			
			49	2.0	24.5
Mouth of Ellis River	83	511			
			65	5.0	13.0
Boston and Maine Railroad crossing	78	446			
			34	5.0	6.8
Conway Center railroad crossing	73	412			
			69	28.0	2.5
Head of Great Falls	45	343			
			72	(*a*)	
Foot of Great Falls	44⅘	271			
Mouth of Ossipee River	40	266			
			271	40.8	6.6
Tide water at Biddeford and Saco	4	0			

a 900 feet.

The important portion of the river is that extending from Great Falls to tide water, covering, as has been stated, a fall of 271 feet in about 40 miles, the drainage area increasing from 856 to 1,734 square miles. The principal owner of power is the Saco Water Power Company, which controls the privileges at Biddeford and Saco, Union Falls, Salmon Falls, and Hiram.

At Biddeford and Saco the river falls over trap ledges, giving a total descent from above the upper dam to tide water of about 40 feet, fluctuating somewhat with the tide. At the upper dam, where the fall is 6½ feet, the power is used only by a sawmill. The remaining fall of 33 or 34 feet, constituting the principal power, is utilized by three cotton manufacturing companies. The York Manufacturing Company, whose mill is on an island in the river, owns 11 mill powers, utilizing 30 feet of fall and 275 cubic feet per second of water, or 937 gross horsepower. Of the remaining power the Pepperell Manufacturing Company owns four-sevenths and the Laconia Manufacturing Company three-sevenths, and these two companies control the Saco Water Power Company, the nominal owner of the power. Their mills are on the south bank of the river, where by a dam across the southern arm of the stream the total fall of 33 or 34 feet is divided into two falls of about equal amount, the Pepperell Company using the upper fall and the Laconia Company the lower fall. The two companies have a total of about 4,500 horsepower of turbines, but can obtain the full capacity of these probably not more than two-thirds of the year. During the rest of the time they rely largely upon steam power, of which they have 3,700 horsepower. The pondage here is small, but is sufficient at points upstream to store all the night flow at low stages.

At Union Falls, about 8 miles above Saco, a fall of 15 feet is caused by a dam maintained for the purpose of holding storage above. This dam is owned by the Saco Water Power Company, as is also the succeeding dam, 20 feet high, at Salmon Falls; but the power at both of these dams, as well as that represented in considerable rapids below the dams, is unutilized. At Salmon Falls the total descent is said to be 62 feet in 3,500 feet, the river running through a narrow, rocky channel with almost vertical banks. A view of the river below these falls is shown in Pl. XIII, *B*.

The next privilege is at Bar Mills, where the Boston and Maine Railroad crosses the river. Here a fall of 18 feet is available, and the power is partly utilized by a furniture factory, a gristmill, and two sawmills. Four or 5 miles above are the Moderation Falls, at which a head of 16 feet is obtained, the power being used for small woolen mills and sawmills. A mile or two farther upstream, and somewhat less than 20 miles due west of the city of Portland, are the Bonny Eagle Falls. The power here is not now utilized. Formerly there was a small sawmill on an island at the head of the falls. Below this mill site heavy rapids extend for perhaps a half mile downstream, giving a total fall on the privilege of 48 feet. The power is an important one, and the site presents favorable features with respect to pondage and facilities for improvement.

Five or 6 miles above Bonny Eagle are heavy rapids extending a third of a mile along the stream, constituting what are known as the Limington Falls, and about a mile farther up are other rapids a quarter of a mile in length. The fall at these two localities is given by Wells as 65 feet and 26 feet, respectively, but the figures seem much too high. At the head of the lower or principal falls the banks are rather low on each side, but a short distance downstream there is a rocky island, and the river banks and bed are also of rock, offering a favorable location for a dam. The river is probably from 250 to 350 feet wide in this portion of its course.

The next water power is at Steep Falls, about 2 miles up the river from the upper rapids just mentioned, and about 25 miles above the power at Saco and Biddeford. Here a dam gives a maximum fall of about 12 feet, the power being used by a pulp mill.

Above Steep Falls there are said to be occasional rapids along the river, probably the most prominent being the Highland Rips, before reaching the Great Falls, in Hiram, about 45 miles above the mouth of the river. Here the stream descends, in successive pitches, a total of 72 feet in 900 feet. An island divides the river at the head of the falls, the banks are of rock, and the topography appears favorable for the development and utilization of the power. The Maine Central Railroad, from Portland to Conway, skirts the east bank of the river at the foot of the falls. This privilege, which is one of exceptional importance, is owned by the Saco Water Power Company, and is

practically unimproved. A high dam can be built here, however, without excessive damage for flowage.

Above Great Falls there is quiet water for about 30 miles, and beyond that the river has too small a drainage area and too variable a flow to be worth consideration.

ST. JOHN RIVER.

DRAINAGE BASIN.

St. John River drains the whole northern portion of Maine as well as large areas in Canada. The topographic character of its basin is widely different from that of any of the streams on the southern slope of Maine. The total drainage area in Maine and Canada is given by Wells as 26,000 square miles, while that in Maine is stated to be 7,400 square miles. Swain gives the area drained by the river and its tributaries in Maine as 8,000 square miles. The greatest length of the basin in the State is about 117 miles and the greatest width from north to south about 90 miles. Next to the Androscoggin this is the most elevated drainage area in Maine, the whole basin being at a considerable altitude and not portions of it at an extreme elevation. For this reason the fall of the stream and the possibilities of the development of water power are far less than upon any of the other large rivers of the State.

The surface topography is of remarkable uniformity. In the eastern, or lower, portion the surface of the country is almost level near the river, and at a distance from the stream it becomes undulating and moderately hilly until it subsides and is merged into the flat country bordering Aroostook River. Highlands or elevations diversify its aspect in the district about the mouths of the St. Francis and the Alleguash. Below those streams the valley of the Upper St. John is quite level to near the boundary highlands on the west and southwest. Large portions of this area are swampy, and the watershed is too flat to throw off the surplus water into the drainage channels.

By far the greater portion of the basin is forested and is comparatively unknown. The rocks prevailing in the eastern part are limestone and slate, with patches of sandstone, quartz rock, and granite, while about three-fourths of the total area is clay slate. On the west, bordering the river on both sides through the upper two-thirds of its length, is a tract of mica-schists. The rock is less exposed than upon the southern slope, and building stone is less readily procurable.

The total length of the river in Maine is estimated to be not far from 211 miles, including the more important meanderings. Its total length from its remotest sources to the sea is about 450 miles. The river receives a large number of tributaries throughout its course, several of which drain lakes and ponds of considerable size.

The greater part of the basin is inaccessible, with few railroads or

highways. The main river is followed closely by the railroad from Frederickton, New Brunswick, up to Edmundston, New Brunswick, on the northern boundary of Maine. The Bangor and Aroostook Railroad crosses the eastern part of the portion of the basin in Maine, but throughout the whole of the upper basin there is neither railroad nor highway.

LAKE STORAGE.

The surface area of lakes in the St. John system is 350 square miles. About 36 square miles of lake surface naturally belonging to it have, by artificial means, been made tributary to the Penobscot. It is probable that a large number of small lakes and ponds in the wilderness districts of the basin are not represented upon the maps, and that if these were included the total lake surface would be somewhat increased. The basin has, however, become more thoroughly channeled with water courses than the southern slope of the State, and many ancient lakes have been obliterated. There is little doubt that the valley of the Walloostook (Upper St. John) was once a long and narrow lake, also the valley of the St. John above the Great Falls for a long distance. The maps of Maine show more than 1,500 tributaries to the river.

No measurements of the discharge of the river have been made, and but little information is obtainable in regard to its variations in flow. The general uniformity of the tributary area, however, favors only moderate rises in the stream, while on the other hand a moderate slope of the river tends to large accumulations of water, the surplus not being passed off rapidly. The characteristics of the basin indicate that the low-water flow of the river and its many tributaries is large. The levelness of the drainage surfaces, the density of the forests, and the low annual temperature must go far toward retaining the precipitation to eke out the low-water flow.

WATER POWERS.

The elevation of the St. John at the State boundary is 419 feet above tide, and at the mouth of the St. Francis 606 feet. The distance between these two points being 70 miles, the mean slope is about 2.6 feet per mile. At the source of the main stream, which is formed by the junction of three tributaries, the elevation is about 750 feet. The distance from the source to the State boundary is 158 miles, showing the mean slope in that distance to be 1.8 feet per mile. It has been stated that the river is navigable throughout a large part of its course.

Comparatively little is known of the water powers of this region, and it is likely that they will remain undeveloped until proper transportation facilities are obtained. Owing to their inaccessibility, their small fall, and the comparative scarcity of building stone, the powers

on the river are not of as great interest as those of the streams on the southern slope of Maine, yet, in future years, many of them will surely be developed, and, on account of the numerous tributary lakes, they will be reliable throughout the year. It is likely that lumbering, and, possibly, pulp and paper manufacturing, will be the leading manufacturing industries.

TRIBUTARIES OF ST. JOHN RIVER.

The St. John has a number of tributaries which have many of the same characteristics as the main stream—i. e., large tributary lake areas, forested basins, little exposed rock, and comparatively deep and fertile soils, but with falls which, though not great, considerably exceed those of the main stream.

MEDUXNIKEAG AND PRESQUE ISLE RIVERS.

Meduxnikeag River drains about 427 square miles in Maine, and affords a number of powers improved to only a small extent. The Presque Isle drains 209 square miles, and also affords some water-power sites, which are partially improved.

AROOSTOOK RIVER.

Aroostook River is the largest tributary of the St. John. It rises in the highlands in the north-central part of Maine, at an elevation of about 1,050 feet, and unites with the St. John near the eastern State line, where it has an elevation of 345 feet. Its total length being 117 miles, makes the average fall 6 feet per mile. The total area of its drainage basin in Maine is about 2,500 square miles, and the many lakes at its headwaters and on its tributaries cause the flow to be comparatively uniform throughout the year. At a number of points along the Aroostook and its tributaries rapids occur which might be utilized for power purposes. In a few isolated cases developments have been made in a small way.

FISH RIVER.

Fish River, the next tributary of the St. John, has perhaps more decided falls than any of the other tributaries. At Wallagrass Plantation there are two falls, one of 20 feet and the other at the outlet of Eagle Lake, a short distance above, where a dam could be built, raising the lake surface. Near the mouth of Fish River there is a fall of 18 feet which could be utilized. Like the other streams of this basin, Fish River, owing to its extensive lakes, has a comparatively constant flow.

ALLEGUASH RIVER.

Alleguash River is the second largest tributary of the St. John in Maine, and drains about 1,650 square miles. Chamberlain Lake furnishes the headwaters of this stream, which, with the smaller lakes in

its basin, gives to the river a comparatively constant flow throughout the year. The river falls 380 feet in the first 60 miles of its course from Chamberlain Lake, giving an average fall of a little more than 3 feet per mile. There are a number of rapids and small falls along the stream, particularly near the headwaters, but these have not been improved, and owing to their inaccessibility they will not be improved for years to come.

ST. FRANCIS RIVER.

St. Francis River, rising in lakes on the Canada border, forms the northern boundary line of Maine for about 40 miles, and has considerable undeveloped power, particularly at its mouth, where there is a single drop of nearly 30 feet.

UPPER ST. JOHN RIVER.

The Upper St. John is known as Walloostook River. It has a number of rapids and small falls, none of which have been utilized.

COASTAL STREAMS.

The streams described on the foregoing pages comprise the chief drainage basins of Maine and embrace the total area of the State, except tracts along the coast which are drained by smaller streams flowing directly into the ocean. Between the St. Croix and the Penobscot are Dennys, East Machias, West Machias, Narraguagus, Union, and other rivers, and between the Penobscot and the Kennebec are the St. George, the Pemaquan, and others, while at the southwestern extremity are the Mousam and the Piscataqua, the latter forming a part of the western boundary of the State. These streams are all comparatively small, but their importance is greater than their size would indicate, from the fact that they are in a more thickly populated part of the State and are nearer the coast, where transportation facilities are much better than in the interior, and that they have considerable fall and regular flow, due to the lakes and ponds tributary to them.

NARRAGUAGUS RIVER.

The basin of Narraguagus River lies to the west of West Machias River and borders the Atlantic Ocean. Closely associated with the Narraguagus are the Pleasant, the Tunk, the Chandlers, and other smaller streams near the coast, all of which have several sites where the fall is considerable, but the flow small. The combined basin comprises about 550 square miles, divided as follows: Narraguagus, 215 square miles; Pleasant, 110; Tunk, about 60; and Chandlers, about 50. Granite prevails along the coast and throughout the western portion of the district, with mica-schists in the valley of Pleasant River. The surface is level to undulating, with occasional low mountains. A large part of the region is still covered with forests.

Tributary to these rivers are 29 ponds having a combined surface of 21 square miles, making the flow rather constant, though none of the powers are large enough to be of great importance. At the head of tide water on Narraguagus River are the Cherryfield Falls, where six privileges exist, the total fall being 52 feet, affording an excellent power, with a reservoir above sufficient to permit the concentration of the flow into working hours. At the Great Falls, at Deblois, there is a second fall of about 50 feet in a half mile, and the power is said to be a fine one.

EAST MACHIAS AND WEST MACHIAS RIVERS.

The basin of these rivers lies just west of Dennys River and borders the coast, the streams entering Machias Bay. The combined basin has an area of 800 square miles, of which the West Machias drains about 458 square miles and the East Machias about 345 square miles. It is considerably broken with hills and low mountains, the highest part of the district being in the northwest, where the mean height for a considerable extent is about 400 feet. Near the coast the prevailing rock is a quartzite, while farther inland granite abounds, and near the headwaters mica-schists prevail.

The West Machias has considerable fall, its average slope being about 5.8 feet per mile. Owing to the extent of the lake surfaces in the basin (70 square miles), the flow of both streams is rather constant, though the East Machias has the advantage in this particular. The lakes being located largely at the remotest sources of the streams, they exert their equalizing effect throughout their length, and if improved as reservoirs would largely increase their manufacturing capacity. Many of the lakes are dammed and the water is used only for log-driving purposes. The lakes at the source of the West Machias have only short tributaries, and therefore fill slowly and can not be relied upon for especially large amounts of reserve water. The lakes being at the headwaters, are not as valuable for power as if located near the falls, but they assist materially in equalizing the flow throughout the course of the stream.

On the West Machias are a number of water-power sites. At the head of tide and of navigation, 6 miles from the mouth of the stream and 3 miles above where it joins the East Machias, there is a fall of 33 feet to high tide, partially utilized. At the Middle Falls, in Whitney, there is a fall of 10 feet, and at the Great Falls, 5 miles above, in Centerville, a fall of 10 feet, with excellent facilities for improvement. In Northfield there is a fall of 28 feet, at the Holmes Falls, and there are a number of smaller powers above.

On the East Machias the lakes are not all near the headwaters of the stream, but are more equally distributed over the basin, thus rendering the flow of the river rather uniform, although the lakes are

used principally for log-driving purposes. The principal power on the stream is at the head of tide, where the fall is 47 feet in 3 miles, and is used in four privileges. Other powers exist above, though they have been little utilized.

DENNYS, PEMAQUAN, AND OTHER RIVERS.

The drainage basin of Dennys, Pemaquan, and associated streams lies to the south and west of the St. Croix, bordering the Atlantic Ocean and Passamaquoddy Bay. This area comprises about 375 square miles, of which Dennys River drains about 150 square miles; Pemaquan, 40 square miles; the remainder being drained by various small streams. The surface is moderately undulating to level, with scattered low hills. Dennys River has a fall of about 250 feet from Meddybemps Lake to the sea, a distance of 25 miles. The flow is comparatively uniform, owing to the influence of the great lake at its head, the total range at Dennysville being 5 feet. There are five water powers.

UNION RIVER.

Union River, comprised almost wholly within Hancock County, drains an area about 20 miles broad, extending about 70 miles inland from the open sea. The total area above Ellsworth Falls is about 500 square miles. Below that place the coast line is much broken by bays and inlets, so that much of the rainfall flows directly into the ocean. The basin is practically surrounded by bald granite mountains, the interior basin being a strongly defined valley with a rolling surface. The scenery in these highland regions, especially near the coast, is varied and grand. The basin in its northern part is at an elevation of from 225 to 250 feet, while the lowest part of the watershed ridge, between Union and Penobscot rivers, is at altitude of 257 feet. About four-fifths of the whole area is underlain by mica-schists, and a large part of it is still covered with forests.

The river is well supplied with natural storage basins, there being in the basin proper 43 lakes, with a total surface area of about 60 square miles. The height of the lake at the headquarters of the river is about 205 feet above sea level, and the mean fall of the stream from this lake to the sea is 4 feet to the mile. The ponds which have been improved for storage are used chiefly for log-driving, and are therefore not of as much value to the water powers as they should be.

The mean annual rainfall in the basin is about 48 inches, distributed as follows: 12 inches in spring, 10 inches in summer, 14 inches in autumn, and 12 inches in winter, a distribution favorable to constant flow. The extreme range of water at Ellsworth is 7 feet.

The Ellsworth Falls are at the head of tide and navigation and are the first water power on the stream. The fall is stated to be 85 feet

in about 2 miles, and 100 feet in 2¼ miles. A part of it is utilized by mills of various kinds, but principally by sawmills.

The upper dam on Union River ponds the water 12 or 15 miles, creating a reservoir large enough to permit the concentration of power into working hours. No measurements of the power available are at hand, but according to estimates of Prof. George F. Swain the minimum power is about 12 horsepower per foot fall, continuous, or 24 horsepower during twelve hours, which would probably be practicable. This would amount to 2,400 horsepower gross on the entire fall of 100 feet. The site is accessible by rail, and the facilities for development are said to be good. The power estimated could of course be largely increased, probably more than doubled, were the reservoirs systematically improved. There are no important powers on the river above this point, though rapids occur at intervals.

The river is navigable as far as Ellsworth Falls, though closed four months of the year by ice. Above the falls ice prevails for a somewhat longer period.

ST. GEORGE, SHEEPSCOT, MEDOMAC, AND DAMARISCOTTA RIVERS.

These streams drain an area of about 800 square miles along the coast between the Penobscot and Kennebec basins. The St. George drains about 228 square miles above the lowest falls, the Sheepscot about 248 square miles, and the Medomac about 62 square miles. Damariscotta River, draining about 43 square miles above the lowest falls, is of unusual importance as a manufacturing stream, on account of the size of its natural reservoir, a pond of the same name. Dyers River, another small stream in this basin, drains an area of about 38 square miles.

The total number of lakes in the basin is 72, though they are all small, their combined area being 50 square miles. They are, however, of much value for pondage in the development of water powers.

The first power on Sheepscot River is a tide power at the Sheepscot Falls. Five miles above, at the head of tide, a fall of 10 feet is used. At The Rapids, the head of which is 2 miles farther up, there is a fall of 25 feet in a mile, with steep banks on both sides, and above this there are several small powers. At the outlet of Damariscotta Pond Damariscotta River falls 52 feet in about 400 feet, and the power is excellent, though small, being rendered constant by the storage in the pond. In the town of Bristol Pemaquid River falls 50 feet in the 500 feet from tide, and the power, being fed from ponds above, is constant, though very small. On Medomac River there are in the town of Waldoboro eight powers, with a total fall of about 80 feet, while other falls occur above. On St. George River there is a woolen mill in the village of Warren, and a power site, known as the Knox

Falls, just above. In the town of Union the stream has considerable fall, and several powers which are in use, while in the upper portion the fall is still greater.

MOUSAM AND KENNEBUNK RIVERS.

These rivers flow into the Atlantic near the southwest corner of Maine and have a combined drainage area of about 260 square miles, of which the Mousam drains about 157 square miles and the Kennebunk about 50 square miles. Their basins are of moderate elevation, with level or moderately undulating surfaces. Granite is almost the only rock occurring. It is of fine quality and is extensively quarried. Nearly all of the forests have been cut and the land is extensively cultivated. The rainfall is about 44 inches, 11 inches falling in spring, 11 inches in summer, 12 inches in autumn, and 10 inches in winter. The river is accessible at nearly all parts by railroad.

The fall of the Mousam is large, probably in the neighborhood of 10 feet per mile, and the flow is constant, owing to the tributary lakes. The first power is $2\frac{1}{2}$ miles from the sea, the fall being 40 feet, in three pitches, only a portion of it being utilized. Two miles above are Lord's cotton mills, with 11 feet fall. A mile farther up is a saw-mill with 9 feet fall, then the Varneys Falls with 12 feet fall, then the Great Falls with 45 feet fall, making the total fall about 185 feet. Wells mentions 16 powers in the town of Sanford with a total fall of about 200 feet, and in the towns above the slope is even greater. The bed and banks of the river are everywhere favorable for construction, and the facilities for storage are good.

Kennebunk River, which empties into the ocean near the mouth of the Mousam, is a small stream fed by Kennebunk Pond, which covers about 540 acres and is capable of being drawn down 4 feet, and by Swan Pond, which covers about 480 acres. The stream affords a few small powers.

PISCATAQUA RIVER.

This stream, with Salmon Falls River, forms a part of the western boundary of the State of Maine. Its drainage basin has an area of about 550 square miles, 240 of which are in Maine and 310 in New Hampshire. About 230 square miles only are drained into the river from Maine and New Hampshire above the lowest falls on the Salmon Falls branch. The area is undulating to hilly, the prevailing rock granite, with patches of mica-schists and quartz rock. The forests have been largely cut.

The river is formed by three tributaries—Cocheco, Salmon Falls, and Great Works rivers. Cocheco and Salmon Falls rivers are described in the Twenty-second Annual Report of the United States

Geological Survey, Part IV. The fall from Northeast Pond, at the head of Salmon Falls River, which may be considered the Upper Piscataqua, to the sea is 449 feet, giving a mean descent of 16.6 feet to the mile. There are 22 lakes in the basin, of which 9 are in Maine and 13 in New Hampshire, their combined area being about 16 square miles.

TIDAL POWERS.

There are a number of developed tidal water powers on the coast of Maine. This type of water-power development requires a peculiar configuration of the coast, so that a large body of water can be held in a land-locked bay and allowed to flow gradually to the lower level of the ocean at the time of low tide. The rise of the tide at Eastport, Me., is 18.1 feet, becoming gradually less southward along the coast. At Portsmouth, N. H., near the western boundary of Maine, it is 8.6 feet. The average for the Maine coast is 11.6 feet. South of New England, where the coasts are made up of sand bars and marshes, were the rise of the tide very great it could not be utilized, on account of the difficulty of holding the water at the turn of the tide and of finding foundations for mills. The coast of Maine, being largely of rock, gives all that could be desired in this respect.

In this type of power development there is no difficulty from ice, and transportation by sea is always good. Power can be utilized for sixteen hours out of the twenty-four. In industries where a large number of persons are employed the ever-changing hours of daily running is a disadvantage, but with many kinds of manufacturing this is of no importance. In Maine the power thus developed is largely used for sawmills, gristmills, and plaster mills.

SUMMARY.

It has been shown in the foregoing pages that the water powers of Maine are remarkable, as regards both amount and constancy.

In every county of the State water power has been developed to a greater or less extent and for a great variety of purposes. The lumber mills are still the greatest users of water power, while the paper and pulp industry, which has grown remarkably during the last few years, now ranks second. Cotton mills, woolen mills, and flour and grist mills are the other chief users of power. The following table, data for which were furnished by the United States Census Bureau, gives the amount of water power used in the various industries in the State.

Water power, in horsepower, used by the principal manufacturing industries of Maine.

County.	Lumber mills.	Paper and pulp mills.	Cotton mills.	Woolen mills.	Flour and grist mills.	Boot and shoe factories.	Miscellaneous.	Total.
Androscoggin	1,122	3,050	9,625	1,785	825	.....	640	17,047
Aroostook	2,658	.....	.....	60	916	.....	40	3,674
Cumberland	1,939	5,545	3,725	522	387	85	53	12,256
Franklin	2,141	.....	.....	175	325	25	6	2,672
Hancock	2,055	.....	.....	139	105	.....	22	2,321
Kennebec	2,527	7,530	5,608	673	781	135	106	17,360
Knox	750	.....	.....	375	156	.....	285	1,566
Lincoln	1,428	.....	.....	8	80	.....	.....	1,516
Oxford	3,100	.....	.....	210	400	.....	7	3,717
Penobscot	8,578	[a]875	.....	1,197	750	.....	70	11,470
Piscataquis	1,625	.....	.....	938	195	.....	4	2,762
Sagadahoc	655	6,850	.....	.....	20	.....	.....	7,525
Somerset	5,159	5,425	.....	1,397	653	.....	107	12,741
Waldo	2,093	300	.....	10	329	.....	130	2,862
Washington	6,402	.....	.....	60	295	.....	10	6,767
York	2,205	200	8,300	650	504	345	140	12,344
Total	44,437	29,775	27,258	8,199	6,721	590	1,620	118,600

[a] The power used at Milinoket is not included in these figures.

It is of considerable interest to note the increased development of water power in the State. The following table, compiled from data furnished by the United States Census Bureau, shows the amount of power, both steam and water, used at the times of taking the last four censuses. It will be noted that the development of water power has been marked, the total amount utilized being more than doubled in the last twenty years. It is also of interest to note that the development now going on is principally in the direction of larger wheels and more extensive plants, shown by the general decrease in the number of wheels and the increase in their horsepower.

Power used by manufactories in Maine at various periods.

Year	Number of establishments.		Total horsepower.	Engines.			
				Steam.		Gas or gasoline.	
	Total.	Reporting power.		Number.	Horsepower.	Number.	Horsepower.
1870	5,550	(a)	79,573	(a)	9,465	.....	.....
1880	4,481	1,918	100,476	511	20,759	.....	.....
1890	5,010	2,022	450,508	965	42,796	(b)	10
1900	6,702	2,377	271,547	1,681	90,751	115	2,405

Year.	Water wheels.		Electric motors.		Other powers.	
	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
1870	(a)	70,108	.....	.....	.....	.....
1880	2,887	79,717	.....	.....	.....	.....
1890	2,396	104,602	(b)	191	(b)	39
1900	2,179	167,264	97	2,087	23	226

[a] Not reported. [b] Not reported separately.

It is of interest in this connection to compare the development of the water powers of Maine with those of the United States. For this purpose the following table, showing the amount of power used in the United States at the times of taking the last four censuses, is inserted:

Power used by manufactories in the United States at various points.

Year.	Number of establishments.		Total horsepower.	Engines.			
				Steam.		Gas or gasoline.	
	Total.	Reporting power.		Number.	Horsepower.	Number.	Horsepower.
1870	252,148	(a)	2,346,142	(a)	1,215,711		
1880	253,852	85,923	3,410,837	56,483	2,185,458		
1890	355,415	100,735	5,954,655	91,410	4,581,595	(b)	8,930
1900	512,721	169,326	11,318,914	157,667	8,756,829	14,890	143,786

Year.	Water wheels.		Electric motors.		Other powers.	
	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
1870	(a)	1,130,431				
1880	55,404	1,225,379				
1890	39,008	1,255,206	(b)	15,569	(b)	4,784
1900	39,213	1,727,567	17,282	314,979	2,151	54,540

a Not reported. b Not reported separately.

The following table shows the number of water wheels in use in the United States at the times of taking the last four censuses, the total horsepower developed by them, and the percentage of gain in the respective decades:

Water wheels in use in Maine at various periods.

Year.	Number of water wheels in use.	Horsepower of wheels.	Percentage of total horsepower.	Increase.	
				Per cent.	*Horsepower.*
1870	(a)	1,130,431	48.2		
1880	55,404	1,225,379	35.9		8.4
1890	39,008	1,255,206	21.1	b29.6	2.4
1900	39,213	1,727,567	15.3	.5	37.6

a Not reported. b Decrease.

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